AGRICULTURAL CHEMICALS

A MONTHLY MAGAZINE FOR MANUFACTURERS, PROCESSORS AND DISTRIBUTORS

AGRICULTURAL INSECTICIDES • FUNGICIDES • STOCK DIPS AND SPRAYS
FUMIGANTS • DAIRY FARM CHEMICALS • WEED CONTROL CHEMICALS • FERTILIZERS
SOIL TREATING MATERIALS • SEED TREATING CHEMICALS • RODENTICIDES

Vol. I July, 1946 No. 3

Sanitation

PAYS BIG DIVIDENDS ON THE FARM, TOO!

Today, more than ever before, the American farmer is sold on insect control and other sanitary measures. Here indeed is a ready market which the progressive distributor and jobber cannot afford to overlook.

Since we have long specialized in the formulation of agricultural chemicals, we are able to offer laboratory facilities and experience that are unsurpassed in this field.

SCIENTIFICALLY FORMULATED PRODUCTS FOR A WIDE VARIETY OF FARM NEEDS

INSECTICIDES

High powered, effective household, cattle and barn sprays, scientifically compounded. DDT, Pyrethrum and synthetic formulations.

DISINFECTANTS

Modern products for general farm, dairy, hatchery or household use.

STOCK DIPS-DDT

Prompt shipments of either coal tar dips or newly developed water miscible products.

Crude Carbolic Acid

This popular insect destroyer, wood preservative-paint available in 15% and 25% grades.

PRIVATE FORMULA DIVISION

For jobbers interested in private brand products, we can formulate disinfectants, insecticides, etc., to your own specifications. Our facilities are at your disposal—no obligation.

Baird & McGuire, Inc.

St. Louis, Mo. Holbrook, Mass.

Baird's

TANK CARS • DRUMS • CARLOADS **DISTRIBUTORS AND JOBBERS ONLY**

THIS MONTH'S COVER

Experimental model of Cornell Spray-Duster being used on orchard near Ithaca, N. Y. Machine was designed and built by Prof. B. A. Jennings of Cornell University's Dept. of Agricultural Engineering, in cooperation with Dept. of Plant Pathology and Entomology. Full account of new methods on page 14.

JULY, 1946
VOL. 1 NO. 3

In This Issue:

AGRICULTURAL CHEMICALS

254 West 31st St., New York 1, N. Y.

Subscription Rates: *One year* $3.00, *two years* $5.00. *Outside U. S. one year,* $4.00.

Published monthly on the 15th by Industry Publications, Inc. Advertising and editorial office, 254 W. 31st St., New York, N. Y. Advertising rates made known on application. Closing date for copy—25th of the month previous to date of issue.

You'll get *better flowability*

...with ATTACLAY

FREEDOM from caking or lumping, called "flowability", is becoming more and more important to the manufacturers of insecticidal concentrates or final dusts, fertilizer concentrates, fungicides, seed disinfectants and similar materials. The job of ensuring high flowability is a function of the carrier or diluent and Attaclay has specific properties that tend to make dusts *free-flowing*. That's why Attaclay is rapidly gaining favor with manufacturers, blenders and users.

Attaclay's fine, porous particles are outstanding in their adsorptive capacity. This characteristic has been substantially helpful in overcoming grinding problems arising from the wax-like nature of DDT. It is the main reason why Attaclay-DDT preparations of highest commercial concentrations flow freely . . . why Attaclay is able to adsorb as much as 30% by weight of oil containing various insecticides without lumping. And, since many new organic poisons tend to be oily or waxy, this outstanding property of Attaclay takes on even greater significance. The high flowability shown by Attaclay is equally important in the final dusting phase, where coverage power and full equipment efficiency depend on free dust flow.

Attaclay has other valuable features. Its uniformity permits accurate formulation. Besides, it is chemically compatible, as indicated by its negligible lessening of the known effectiveness of certain important toxicants. And its lightness suggests pound for pound economies when compared with heavier carriers.

Perhaps Attaclay is the carrier or diluent you have been searching for. It may show you the way to smoother processing and a better product. Plan to run a test now . . . we'll gladly send a generous sample. Of course, there is no obligation.

ATTAPULGUS CLAY COMPANY

DEPT. P, 260 SOUTH BROAD ST., PHILADELPHIA 1, PA.

NOW... A DEPENDABLE SOURCE FOR ALL YOUR DDT REQUIREMENTS

Ready to help you meet the tremendous demand for DDT Insecticides for sanitary and agricultural use, CYANAMID offers you an established, dependable source of supply for all your DDT needs. CYTOX DDT and CYTOX DDT Formulations are based on DDT-TECHNICAL, which meets Joint Army and Navy Specifications for DDT (J.A.N. D-56A).

CYTOX Formulations, to meet all DDT Insecticide requirements, include:

Cytox 25% DDT Liquid Concentrate

CYTOX 25% DDT LIQUID CONCENTRATE is formulated for use in the manufacture of effective sprays for homes, hotels, public institutions and also for dairy barns, stables and similar structures, for the control of flies, mosquitoes, bedbugs, clothes moths, carpet beetles and other insects infesting enclosed areas.

It contains 25% DDT-TECHNICAL, completely dissolved and ready for dilution with kerosene or other petroleum vehicles. Deodorized kerosene is recommended for odorless household sprays and ordinary kerosene can be used in sprays for rough structures such as barns and stables.

CYTOX 25% DDT LIQUID CONCENTRATE is now available for immediate shipment in 10- and 55-gallon drums.

Cytox 50% DDT Dust Concentrate

DDT dusts of any desired concentration can be prepared with CYTOX 50% DDT DUST CONCENTRATE for use in the control of insect pests on agricultural crops or the control of external parasites on man and animals. CYTOX DUST CONCENTRATE contains 50% DDT-TECHNICAL and can be mixed easily with inert diluents such as non-fibrous talcs and clays. It produces free-flowing, non-caustic dusts with excellent adhesion to plant foliage. These dusts will effectively control a wide range of insects.

Cytox 50% DDT Wettable Powder

CYTOX 50% DDT WETTABLE POWDER is ready, by dilution with water, for outdoor sprays to control such insects as codling moth, gypsy moth, tent caterpillar, Japanese beetle, Colorado potato beetle and thrip. It also produces effective sprays and dips for the control of flies and ticks on cattle and other animals and for spraying barns and stables.

Write or phone today for additional information on the preparation of insecticidal dusts and sprays with CYTOX DDT CONCENTRATES, as well as specific recommended uses. Mail the coupon today. Your inquiry will receive prompt attention.

AMERICAN CYANAMID & CHEMICAL CORPORATION

(A Unit of American Cyanamid Company)

INSECTICIDE DEPARTMENT

32-M Rockefeller Plaza, New York 20, New York

Branch Offices: 628 Dwight Building, Kansas City 6, Mo.
2203 First Avenue, South, Seattle 4, Wash.; Azusa, Calif.

American Cyanamid & Chemical Corporation
Insecticide Department
32-M Rockefeller Plaza, New York 20, N. Y.

Please send additional information .... and prices .... on Cyanamid's new DDT Formulations:

CYTOX 25% DDT LIQUID CONCENTRATE.....
CYTOX 50% DDT DUST CONCENTRATE.....
CYTOX 50% DDT WETTABLE POWDER.....
CYTOX DDT-TECHNICAL (Setting Point 89° C. minimum).

Name.....
Company.....
Address.....
City..... *Zone*..... *State*.....

PENICK INSECTICIDAL BASES...

Sure does Knock 'em Down and Knock 'em Out

The men who work the fields are aware of the need for potent insecticides in their never-ending fight against pests. Those men know that Penick insecticidal bases give them full KNOCK-DOWN and KNOCK-OUT POWER without scorch or injury to their crops.

S. B. PENICK & COMPANY offer a dependable product for a majority of your needs. IMPREGNO ...a unique development in PYRETHRUM application as an insecticide is the use of clay impregnated with Pyrethrum Extract. The Pyrethrins content of IMPREGNO is 2%. IMPREGNO is effective because the Pyrethrum Extractives are coated on the outside and not locked in the natural powdered Pyrethrum flowers. Tests on large acreages of cabbages, cranberries, beans, mushrooms and wherever Pyrethrum is applied as an agricultural dust, demonstrate its potency. IMPREGNO is economical ... when emulsified the oil globules are so finely divided that they spread evenly over the foliage, and when used as directed give no burn.

50% DDT WETTABLE DUST ... for agricultural sprays. The fine particle size plus effective wetting agent is the reason for the excellent control.

50% DDT DISPERSIBLE POWDER ... for household, agricultural and live stock dusts.

DDT EMULSIONS ... fine particle size likewise assures results ... for live stock, agricultural and residual barn sprays.

Impregno is packed in handy-sized metal drums containing 100 pounds each. We recommend that large users of Powdered Pyrethrum Flowers investigate the merits of Impregno.

Write for descriptive literature covering our full line of Insecticidal Bases.

S. B. PENICK & COMPANY

50 CHURCH STREET
NEW YORK 7, N. Y.
Telephone: COrtlandt 7-1970

735 W. DIVISION ST.
CHICAGO 10, ILL.
Telephone: MOHawk 5651

THE EDITOR COMMENTS

PURCHASES of insecticides and other agricultural chemical products by divisions of the Government such as UNRRA, Army, Navy, and others have tended to throw the production and supply of these materials out of gear, and seriously to disturb the market because of the unrelated manner in which this buying is conducted. Under present conditions of shortages, the effect of concerted government buying is to exaggerate the supply problem. There is need to clear government department requests for bids through some central agency so that purchasing may be timed to avoid disrupting the supply situation. We suggest that, in the interests of both industry and the government, all bids should be cleared through a division of the U. S. Department of Agriculture.

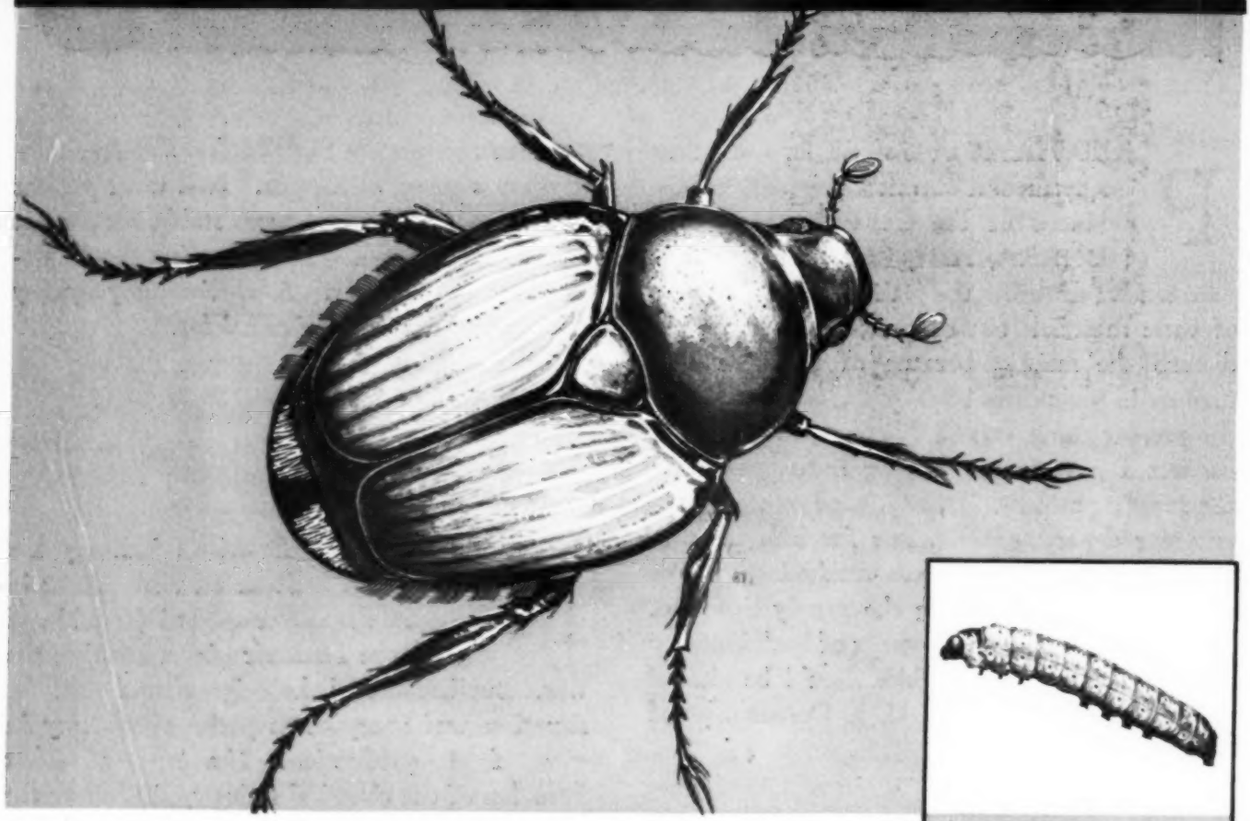
UNCERTAINTIES in regard to prices have in some fields almost reached the stage of chaos. Some manufacturers have come forth with flat statements that they will hold to their old prices, others say that they will hold as long as costs permit, and still others have announced price advances. Then there is that group which has quietly raised prices without any further ado. In the field of chemicals, both agricultural and otherwise, there have been some isolated sharp advances, mostly in second hand channels. On the whole, prices of basic chemicals have thus far held without great change. But this is no assurance that they will continue to do so.

In view of the uncertainty as to just what prices may do over the next few months, we feel that the course of wisdom at this time is to announce no definite price policy. Whether manufacturer, jobber, dealer or whatnot, no firm can afford to commit itself until it has a clearer view of what is going to happen. And until present upset conditions become more stable, we cannot see how any long-range price policy can be determined intelligently. A cautious day-by-day pricing would seem to be called for.

NO branch of American industry has looked with favor on the manner in which the Government injected itself into the fertilizer picture during the war. But because of the exigencies of war, the situation was accepted as perhaps necessary in vital food production. Nevertheless, other branches of the chemical industry, including the insecticide and fungicide group, have viewed the fertilizer set-up as a bad precedent which on the same basis of argument for fertilizers, might spread to other agricultural chemical necessities.

Now, with the Government in fertilizer production in a big way as the result of the conversion of fifteen ordnance plants for nitrate manufacture, the question naturally arises as to what will happen to these plants when the present emergency is over. Frankly, we do not feel that there should be any question whatsoever! They are being manned for one purpose,—to make fertilizer for export,—and when that purpose has been served, they should be dismantled. Or if their continued operation is warranted, they should be turned over to private industry. For the Government to continue in the fertilizer business would be just another step toward stifling American free enterprise. Let us make sure well in advance that when the emergency ends Government manufacture of fertilizer will end also, —and promptly!

JAPANESE BEETLE—attacks soybeans, corn, and many other vegetables and fruits



CODLING MOTH

JAPANESE BEETLE

COLORADO POTATO BEETLE

Baker's D D T

(Dichloro-diphenyl-trichloroethane)

PROMISES CONTROL OF THIS PEST

The Japanese beetle gets in most of its deadly work throughout the Eastern states where it is the scourge of soybeans, corn, and many other vegetables and fruits. The Japanese beetle is one of the six major crop pests against which the use of DDT has proved effective.

United States Department of Agriculture tests indicate that this troublesome beetle may be effectively controlled through the use of DDT in the soil or as a spray on fruit trees.

DDT also promises effective control of such major crop pests as the codling moth and the Colorado potato beetle. As tests in the agricultural field, to be conclusive, require several growing seasons, only tentative formulation recommendations are available at this time.

Baker's DDT is a fine, crystalline powder and is available in 25, 50, 100 and 200 pound containers. It has a minimum setting point of 89°. Write for prices, stating your requirements. Address J. T. Baker Chemical Company, *Executive Offices,* Phillipsburg, N. J.

FREE DDT BIBLIOGRAPHY — The J. T. Baker Chemical Co. has collated, in brief form, releases regarding DDT from various governmental branches. If you would like a copy, ask for the *free* DDT BIBLIOGRAPHY.

J. T. Baker Chemical Co., *Executive Offices and Plant:* Phillipsburg, N. J. *Branch Offices:* New York, Philadelphia, Boston and Chicago.

Baker's Chemicals

C. P. ANALYZED • FINE • INDUSTRIAL

Guest Editorial written especially for this issue of Agricultural Chemicals.

Government enters fertilizer field as emergency measure

by Maurice H. Lockwood

President, National Fertilizer Association
Washington, D. C.

THE American fertilizer industry is today carrying the heaviest load in its history in an effort to help feed a hungry world. Every possible means is being used to bring about greater food production, with emphasis being laid on fertilization of the nation's agricultural soil. The recent addition of fifteen United States Ordnance plants to those already manufacturing nitrogen fertilizers is an important step in augmenting the world's supply of fertilizer.

Despite the fact that these additional manufacturing facilities will produce an estimated 70,000 tons of ammonium nitrate a month —an increase of about 50% in the nitrogen production of the United States—the American farmer will not realize an immediate benefit from the move. The additional supply will be produced for shipment to war-ravaged countries of Europe and Asia whose soil fertility has suffered acutely during the years of hostilities.

The government's decision to bolster the world supply of fertilizer comes as an emergency measure to help out at a time when the need for immediate aid is obvious. The government plans to "borrow" supplies from commercial producers, and this is bound to cause some temporary inconvenience in the industry, and may become serious or even disastrous to American agriculture unless materials are returned in plenty of time for the manufacture of fertilizer for our crops. Nevertheless the fertilizer industry will "lend" all that can be spared with an unselfish attitude toward less fortunate peoples abroad. A display of intelligent benevolence at this time could conceivably go a long way toward sealing world friendship.

It should be borne in mind, however, that this program is of strictly an emergency nature, launched to meet unprecedented demands for fertilizer at home and abroad. The extra supply will doubtless be of inestimable help in accomplishing its end of feeding other lands, which is a commendable purpose. The operation of these government plants was, as a matter of fact, approved by the United States Department of Agriculture Fertilizer Industry Advisory Committee at a meeting last April 18.

(Turn to Page 61)

A FRIEND recently commented that he preferred the "rush of the good old days" to the present fast pace which is being set in agricultural pest control by the development of new equipment and materials. This seems to be a rather common feeling among many workers because the new developments are coming so rapidly that a certain amount of confusion is inevitable.

We pause at times to reflect on the period of standard high pressure sprayers and conventional types of dusters and wonder where the field of insect and disease control is now directed. With the current principles of application which are being worked on, I am sure that all of us are glad to have the opportunity to participate in this period when new developments are the order of the day, even though the diversity of machines and materials is confusing.

It is significant to remember that the fields of insect and plant disease control are expanding rapidly. Within the memory of many of the older men in the profession there was a time in this country when a handful of trained workers were eagerly exploring the possibilities of the chemical control of plant pests as a new aid to production and protection of farm crops and stored commodities. The loose teamwork, begun in these early days, at the close of last century and the early 1900's, between the professional entomologist and plant pathologist, the chemical industries that produced the materials and machinery manufacturers whose interests turned toward application equipment, has continued and grown until the present time. As is always the case in a new field of cooperative enterprise, more and more workers became interested and through their collective effort, a fundamental background of knowledge has evolved concerning the life histories, habits and distribution of the plant pests. A similar expansion in the field of agricultural chemicals has provided new insecticides and fungicides. Engineering advances likewise afforded improvement in equipment for the application of these chemicals. Slowly but surely the realization of the interdependence of these three groups, each one on the others, has brought forth the current recognition of the value of the cooperative approach to aiding the farmer who in the final analysis, is the one for whom pest control is developed. The American farmer has demonstrated his ability to increase production through the control of diseases and insects; he is eager for better methods and because of his experience and innate experimental nature has contri-

By Dr. Charles E. Palm

Head of Department of Entomology
Cornell University, Ithaca, N. Y.

Left: Experimental test with Todd Insecticidal fog applicator applying DDT for horn fly control on dairy heifers. Machine is mounted on truck at right.

buted many worthwhile ideas toward improvement of methods in pest control.

By the middle thirties the economic entomologist had come to rely upon a number of proven inorganic insecticides, for example lead arsenate, calcium arsenate, several of the fluorine compounds, a number of botanical organic materials including nicotine, pyrethrum and rotenone plus a small number of other well-known chemical compounds. Special fields of usefulness had brought forth various types of fumigants, petroleum oils, sulfur and other materials. The importance of residue problems with the arsenicals and fluorine compounds stimulated research with the so-called non-poisonous sprays and dusts on fruit and vegetable crops. By and large, however, the high pressure sprayer and high velocity duster still remained the same in principle with such modifications in design as pneumatic tires, higher pressures, various types of brooms and guns and similar advances. By the late thirties development in materials for pest control had been more rapid than in new principles for their application. But during this period machinery improvements were under way with such new devices as the Speed Sprayer, improved ground atomizing equipment as well as practical use of the airplane for spraying and dusting row crops, the high volume-low velocity dusters and others. Then came the war which of necessity slowed down extensive experimentation and commercial production of equipment. Almost simultaneously, production of synthetic organic insecticides, stimulated by wartime needs, has given the entomologist in this post war period a number of new chemicals that definitely are "above threshold" in efficiency. The ability to apply several of the new insecticides as concentrates is making possible the investigation of principles of application heretofore held impracticable. The feasibility of residual contact action with DDT and other insecticides has added a new concept of the entomologists' procedures for control. Likewise the high toxicity of some of these new organics has further emphasized the problem of their effect on organisms other than the pests for which they are applied, as well as possible plant toxicity. The idea of minimum effective dosages is again an important consideration.

The recent extensive expansion of industrial research in the field of agricultural chemicals is noteworthy and its effect is several fold. First, perhaps, is the increasing number of new organic compounds that are being developed. Another important

feature is the screening and evaluation of new materials by the larger companies within their own research laboratories before they are given field trials. It is reasonable to expect that the next few years will find a far greater number of promising new compounds than the average person thought possible. Fortunately the introduction of new materials stimulates an interest in methods for their application; the combined improvements in the means for pest control make possible the expansion of the service to new fields with reasonable hope for success. As an example, the use of the airplane in forest insect control was hampered when one had to depend upon dusts of inorganic insecticides. It was difficult to carry a 'payload' and cover an acreage of any size before having to return to the landing field for refilling.

DDT has made possible the use of concentrate sprays applied from the upper air at the rate of one gallon per acre, containing one pound of DDT, with exceptionally good control of the gypsy moth. This startling development, and others, makes the entomologist as well as the layman stop and think. The use of one gallon of spray concentrate per acre of woodland is a far cry from the high pressure spray procedures which required several hundred gallons with the tedious work of dragging hose lines over forest terrain to accomplish the same objective. Similar developments with the airplane for insect control during the war by the military open new avenues of hope for the entire field of insect control in relation to public health and agriculture.

During the war years American agriculture provided an enviable production record. Like some other notable accomplishments it was done with a shortage of supplies and manpower. Nevertheless, it was done, and done well. Farmers used equipment that was worn beyond the state of normal replacement, but there was no choice. If it broke down it was repaired and kept in use. Sprayers and dusters for insect and disease control were no exception. The need for replacements plus the hope of improved

Insecticidal dust being expelled from the Buffalo Turbine Sprayer-duster under high pressure.

Famous Long Island potatoes receiving heavy application of DDT from Todd Insecticidal Fog Applicator.

Close-up view of Buffalo Turbine Sprayer-duster with axial flow blower. Hose leading out to distributor enables water to be injected into the air stream.

Coast Guard helicopter, in cooperation with the Bureau of Entomology and Plant Quarantine, and the Cornell University Agricultural Experiment Station applying DDT on Long Island potatoes.

Rear view of gas-propelled aerosol sprayer. Canvas apron prevents escape of the insecticide. Machine built by the cooperative GLF Exchange, shown here being used on onions for control of thrips.

Close-up view of discharge nozzles of the gas-propelled aerosol equipment. Hand in upper right corner shows relative size of machine.

methods have created an unprecedented demand for pest control equipment. Growers are eager to get the facts on the new developments; production costs and continued demand for agricultural commodities as well as the inadequate supply of competent farm labor focus attention on developments in machinery as well as materials. Any one who has attended grower meetings during the past two years is well aware of this interest. Farmers are ready to buy if they are certain that a particular piece of equipment will do the job, and particularly so if this equipment provides labor saving features.

There has been a tendency, probably a very human one, to place speed of application with the elimination of excess manpower, as criteria of a successful piece of equipment. I have talked with spray and dust machine operators who felt that the number of acres covered per day was a measure of their ability in insect control. The fact remains as it always has, *efficiency in control* is the real criterion of the job being done. If good control can be obtained without sacrificing speed of operation, well and good. But labor saving and speed of application are in themselves poor compensation if they result in ineffective pest control.

Many growers during the war period came to appreciate the value of insecticides and fungicides. All-out production was needed and crops lost to insects and diseases were of no value. It was not a question of whether it would pay to control a serious pest—the foodstuffs were needed to feed ourselves and our allies. We are going into this post-war era with this additional backlog of users of agricultural insecticides, fungicides and application equipment with the value of pest control firmly in their minds. They too are eager to keep abreast of new developments.

One may ask why the necessity of reviewing what has happened when it is the new features that interest us. I feel that a glimpse at where we have been helps us to understand where we now stand and should be of guidance

in determining our next steps. It is obvious that materials are of little value unless they are properly applied. Equipment for their application is therefore an essential part of insect and disease control. It is beyond the realm of any individual to keep abreast from personal experience with all the developments in equipment throughout the country. Further, it is a changing story, almost from day to day, and will require frequent appraisal from many different people at their own vantage point.

In commenting on some of the principles of application it is not my purpose to appraise the value of the different methods, but rather to indicate some of the interesting developments that are being used or are under experimentation. Both laboratory and field experimentation are back of the developments before they reach the grower's hands. It is reasonable to expect that many changes and improvements will be made in a particular type of machine based on experience in the field on different types of work. For this reason, care must be exercised in passing judgment too hastily on a principle of application during the developmental stages. The saying that 'the latest is never out' is true during the period when working units are undergoing experimental tests. The most substantial progress in design and operational efficiency can be obtained from actual experience on the job.

Custom Work Expands

ONE of the interesting trends in certain fields of insect and disease control is the custom operator. Numerous benefits are derived from custom application of materials. Take for example the small grower who cannot afford the investment in expensive equipment for the acreage of potatoes he is growing. If this grower can employ a reliable custom spray operator to contract the job of spraying his potatoes for a definite fee per acre per application, the grower is relieved of the responsibility of pest control, investment in equipment, labor costs etc., and can profit from the use of modern equipment because the operator has sufficient business to keep his equipment in top condition and up to date. The full significance of custom application of insecticides and fungicides cannot be assessed at the moment although new materials and machinery are making commercial ventures successful in many agricultural fields. In New York State, for example, custom spraying of potatoes has developed quite rapidly in recent years and last season a similar venture in custom spraying of grapes proved successful. Interest in the potato spray rings expanded last summer in some areas to treatment of cabbage. This season promises a rather widespread custom service for application of DDT as a residual fly spray in dairy barns and other farm buildings. This operation fits into an already well established whitewash service, but doubtless will expand beyond present existing facilities because of the demand for fly control by practically all farmers. Sometimes the custom application of insecticides and fungicides fits into an operators schedule of work on a seasonal basis. One of the potato spray ring operators, for example, drove a school bus during the fall, winter and spring months. During part of the day he worked on his equipment for potato spraying and lime spreading. By the time summer came, he was equipped and ready for his spraying operations. With high pressure sprayers, most potato spray rings care for between two hundred and fifty and three hundred acres each. Some of the men are building special vats for mixing the spray materials on a truck which is driven into the field to the sprayer for refilling with a minimum loss of time on the part of the sprayer operator. Others haul water and materials on a truck and mix into the tanks on the sprayer. Labor saving devices aid in reducing costs as well as in increasing the amount of acreage that one machine can cover.

We are watching with considerable interest the development of the airplane within the state for application of insecticides and fungicides to certain vegetable crops, potatoes and forage crops. The fix-winged plane offers possibilities on muckland soils for covering large acreages quickly and thus making possible proper timing of applications. Under our conditions the airplane is still in the experimental stage in agricultural pest control even though its use has been extensive in other areas for several years. Interest in airplane application has been stimulated by pilots returning from the war desirous of developing a service in their own home communities as well as by the development of better application equipment and new insecticide materials. The immediate future may see rather great expansion of airplane application on potatoes, onions and even forage crops in the northeast, if comparable efficiency can be obtained to that derived from ground machinery. Probably more airplane application will be done this season on field and vegetable crops under New York conditions with insecticide and fungicide dusts than with concentrates.

The helicopter catches the imagination of the entomologist and plant pathologist as a means of conveying insecticide and fungicide dispersing equipment with more latitude of operation than the fixed-winged plane, particularly so in areas where there are small fields surrounded by hedgerows as is the case in upstate New York. The maneuverability of the helicopter, the slow speed at which it can be operated and the ability to go from field to field with a service truck without the necessity of an airport for refilling are points in its favor. The use of the helicopter in agricultural pest control is definitely in the experimental and developmental stage. Growers as well as professional workers are watching this means of aerial application with great interest. In the 1945 season, workers in the Experiment Stations in New York had an opportunity to cooperate on limited experimentation with the U. S. Coast Guard and the Bureau of Entomology & Plant Quarantine with a Coast Guard helicopter. An insecticide concentrate containing DDT was applied under pressure through a spray boom attached to the under

(*Turn to Page* 62)

Airplane Spraying

PART II

By W. L. Popham

Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture

AIRCRAFT spraying equipment is of comparatively recent origin, closely associated with the progress made in concentrating liquid insecticides, since dilute sprays involve weight and volume that cannot be handled economically with aircraft. Late in 1941 Campbell and Whittam equipped a New White Standard biplane with a so-called spinner-disk device for spraying lead arsenate or cryolite concentrates. This was a modification of the equipment previously used in an autogiro. This unit consists of a 65 gallon tank securely fixed in the front cockpit from which the insecticide is fed from a 2-inch outlet to the center of a 12-foot cross boom 2 inches in diameter. The cross boom is firmly secured to the lower longerons and a spinner-disc spray unit is mounted at each end. Each unit consists of 4 steel discs approximately 14 inches in diameter, spaced 1/8 of an inch apart. These are mounted on steel shafts about 18 inches long,—at the forward ends of which are 6—bladed fans. Deriving power from the slip stream, the fans, shafts, and discs rotate at 2,000 to 2,500 r.p.m. The insecticide flows by gravity from the tank to the rear bearing housing of the distributing unit and from there into a 2½ inch cavity in the center of the discs, to be fed onto the concave or forward side of each disc in a thin film, which is thrown from the periphery by centrifugal force. The release of the liquid is controlled by the pilot. The spinner-disc device has proved an effective instrument for distributing any type of insecticide from an oil solution to a highly concentrate suspension of abrasive materials such as 50 lbs. of cryolite in 10 gals. of water. When flying 50 ft.

Below: U. S. Army L-48 equipped with portable insecticide dispensing equipment developed by Husman and Longcoy at the Orlando, Fla. laboratory. Propeller rotates at about 2,500 revolutions per minute to provide power for dispensing insecticides over wide areas. Gauge on apparatus keeps pilot informed as to RPM and functioning of spray equipment. (Photo courtesy U. S. Dept. of Agriculture, Bureau of Entomology and Plant Quarantine).

above tree tops, it gives an even distribution of spray over a swath about 100 ft. wide.

Boom Device Popular

ANOTHER spray device that is proving quite satisfactory for a biplane of the Stearman, Waco, or M3N-3 type consists of an aluminum or other light weight metal tank, fitted into the front cockpit from which the spray material is fed into tubes or booms extending approximately the full length of the wings. A pump driven by an auxiliary propeller holding a pressure of 50 to 70 lbs. on the liquid in these tubes insures an even flow. More pressure may be desirable for some types of work. The outlets from the booms under the wings may be any one of several types of nozzles, depending upon the nature and consistency of the insecticides being used. Outlets along the booms are spaced 3 inches apart and the rate of application may be varied by increasing or decreasing the number of outlets used or the size of the apertures in the nozzles. A biplane of the advance trainer type thus equipped will give an even distribution of insecticide over a swath at least 80 ft. wide when flying 10 to 12 ft. over row crops, and a 100 ft. swath when 50 ft. above tree tops.

A third unit under test this year for forest spraying has a single nozzle anchored near the tip of each of the lower wings of a biplane. The insecticide is released from a tank in the fuselage through flexible metal tubing located inside the wings. Limited experience with this unit indicates that multiple nozzle booms may not be necessary for certain types of spraying. The single nozzle device is easily installed, simple to operate, and involves somewhat less weight than other installations in use.

The possibility of using larger planes for spraying or dusting extensive mosquito breeding grounds, forested areas, or Mormon cricket and grasshopper infested range lands has not been overlooked. In 1945 the Province of Ontario, with the cooperation of the Royal Canadian Air Force, treated areas comprising approximately 100 sq. miles in the Lake Nipigon region with an oil solution of DDT for control of the spruce budworm. This work was done with four CANSO amphibian planes carrying at least 1½ tons of insecticide each trip. Much of the spraying was done 75 to 100 miles from base. The results of the work canont be accurately appraised until surveys are made in 1946 to determine the extent to which the infestation was reduced as a result of treatment. Some difficulties were reported in connection with the operation. Planes of this general type cannot be flown with safety closer than about 200-300 ft. of the tree tops, which permitted considerable drift of the finely atomized spray before it reached the foliage. Some difficulty was encountered in keeping pilots on their course, as they were depending largely on natural land marks for guidance.

Ordinary crop dusting and spraying from the air will undoubtedly remain a job for the smaller planes which have a cruising speed of 80 to 90 miles per hour or less. Planes used for treating crops should be of rugged construction, economical to operate, responsive to controls, and have adequate power for pulling out of tight places. Because of close flying (6 to 12 ft. from the ground when treating row crops, or 30 to 60 ft. from tree tops) equipment should be maintained in the best of operating condition at all times; and in the interest of safety, pilots inexperienced in crop dusting should acquire some special training in this type of flying. The experienced crop duster demands maximum lift and maneuverability in relation to horse power and a plane that can be operated economically from improvised landing strips.

Scope of Use Widens

THE use of aircraft for dispensing insecticides is expanding rapidly. New insecticides suitable for this method of application are now in use, others may be expected. All-out mosquito and fly control effort in many parts of the United States and in other parts of the world, particularly in the tropics is gaining momentum. With available insecticides and aircraft dispensing equipment, it will be possible to treat extensive forested areas to protect timber resources from insect damage and to do the job within the economics of the crop. There will be expansion in the use of planes for treating such field crops as cotton, sugar cane, potatoes, beets, peas, legume seed crops, and sweet corn. Already some thought has been given to the practicability of treating small grains for the control of Hessian fly, chinch bugs, and saw flies; and field corn for protection from corn borer.

Advantages to be gained by treating from the air include covering large acreages rapidly, applying insecticides when the ground is too wet for the operation of other types of equipment, treating areas inaccessible to ground units, and applying insecticides without disturbing the crops. To offset these advantages, it must be recognized that dust or finely atomized sprays may drift to adjacent fields.

Pilots inexperienced in pest control work who contemplate engaging in crop dusting and spraying should have in mind that there are many different kinds of insect pests and plant diseases. Not many of them react alike to one particular treatment. For that reason there are many different insecticides and fungicides on the market and the one to use depends upon the particular insect or disease causing trouble. The crop duster need not be an entomologist or a pathologist, but he must have a source of sound entomological and pathological advice to possess a working knowledge of the reproductive and feeding or growth habits of the pest or pests involved. Extremely toxic chemicals are now used in formulating insecticides and fungicides. In the future many of them will be applied as concentrates and minute quantities necessary to secure adequate crop protection must be evenly distributed to avoid over-treating in one place and under-treating in another. Only an expanded and well directed research program will keep pace with a rapidly growing public interest in these matters.

By R. C. Roark

Division of Insecticide Investigations,
Agricultural Research Adm., U. S. Dept. of Agriculture

A comprehensive review of development of DDT insecticide throughout the world. Many countries take part.

DDT was first synthesized in Germany and first tested as an insecticide in Switzerland. Much work has been done with DDT in England, and trials with it against flies, mosquitoes, and numerous other insects have been made in Algeria, Argentina, Brazil, Canada, Chile, Denmark, the Fiji Islands, Panama, and Sweden. DDT has been tested as a fungicide in Australia and prepared on a small laboratory scale in Mexico and South Africa. An antidote for it has been proposed in Brazil. Many popular articles on DDT have been published in all these countries and in Colombia, Cuba, India, and Peru.

Published results of this foreign work have been slow in reaching this country because of the disruption of transportation during the war. Even in the enormous library of the United States Department of Agriculture, files of many foreign periodicals are incomplete and certain journals have not been received for several years. The receipt of foreign patents has been even more delayed. It is probable that several foreign patents covering insecticidal compositions containing DDT have been granted inventors, but we shall have to await the establishment of normal conditions in Europe before copies reach this country.

The writer has been fortunate in receiving reprints of some of these foreign reports of work on DDT and has had access to certain journals not in the Department library. In view of the widespread interest in DDT, it seems appropriate to review briefly what has been done with this product in other countries for the benefit of readers unable to consult the original reports. A review of work done abroad also enables us to maintain a proper perspective and to evaluate better the work done in this country. (This review is based on foreign publications that were received in the United States through December 1944. For reports of the early American work with DDT see Annand *et al.* (43); abstracted by Roark and McIndoo (118).

The product now called DDT was first synthesized by Zeidler (156) in 1874 while a student at the University of Strasburg. He heated 2 mols of chlorobenzene and 1 mol of chloral in the presence of concentrated sulfuric acid and obtained, after crystallizing from ether-alcohol, white needles (m.p. 105° C.) of the formula $CCl_3CH(C_6H_4Cl)_2$. The position of the chlorine atoms in the benzene ring was not proved. Only recently, as a result of the investigation of Haller *et al.* (84), has it been shown that Zeidler's condensation product contains about 70 per cent of the para-para' isomer of dichlorodiphenyltrichloroethane, about 22 per cent of the para-ortho' isomer, the remainder consisting of 10 or 12 compounds each present in small amount.

In the same number of the journal in which Zeidler recorded his experiments with DDT in six lines, Otto Fischer (73) reported on the product formed by reacting chloral and toluene, namely, ditolyltrichloroethane (m.p. 89° C.). This compound

is of interest, because, like DDT, it is covered by the Müller (110) patent on a devitalizing composition of matter.

Not until 1942 do we find another German publication on the chemistry of compounds related to DDT. In that year Brand and Busse-Sundermann (45) reported on the formation of 1,1 diaryl-2,2 dichloroethylene by splitting off hydrochloric acid from the corresponding trichloroethane, a reaction described also by Zeidler, and recently studied by Fleck and Haller (75).

The first report published in Germany on the use of DDT as an insecticide appeared in July 1943 under the authorship of Kotte (92) and described tests with "Gesarol" and "Gesapon," the Geigy company's proprietary DDT insecticides, against several species of insects including cabbage worms, the Colorado potato beetle, and flies in stables. Zattler (155) in the same month described tests made in Germany with "Gesarol" during the summer of 1943 for the control of the hop aphid.

Götz (82) reported both "Gesarol" dust and spray to be effective against the raspberry beetle in laboratory tests. Stellwaag (133) reported that "Gesarol" dust kills adult clothes moths and their newly hatched larvae by contact but that the eggs and older larvae are more resistant. The insecticide was dusted over clothing, carpets, furs, and upholstered furniture.

Müller (109) discussed the use of DDT insecticides against flies.

Mandekos (102) in 1944 reported on tests made the previous summer in Macedonia by the German army of occupation. "Neocid" dust (containing 5 per cent of DDT) was tested against mosquitoes from June 25 to September 24, 1943. Experiments in cow stables in Salonika with "Neocid" in aqueous suspension (6 grams per 100 ml.) showed that the application of 1 gram of "Neocid" per square meter of wall surface was sufficient to kill all anopheline mosquitoes and to keep a stable free of them for 1 month. A "Neocid"-petroleum mixture applied at the rate of 0.15 gram of "Neocid" per square meter of water surface was ineffective against the eggs and pupae of mosquitoes but effective against larvae. The species dealt with were *Anopheles superpictus* (Grassi) and *Culex* sp.

Control of insects as a means of increasing food production is a world-wide problem. Study of DDT attracts current attention of entomologists.

Frey (76) in March 1944 described tests with "Gesarol" dust made during 1942 at the Biologische Reichanstalt in Kiel, Germany. This product was found effective against the rape beetle, *Meligethes aeneus* (F.), both in the laboratory and in the field, and in 1943 the Deutschen Pflanzenschutzdienst officially endorsed it for this use. Holst (90) also reported on the use of "Gesarol" against this insect.

Swiss Work with DDT

FROELICHER (77), Lauger *et al.* (94), Campbell and West (53), and the Geigy Company (80) have given accounts of the early Swiss work with DDT. According to Mooser (107), "Dr. P. Müller, the collaborator of Lauger, who carried out the synthesis of DDT, sprayed potato plants infested with Colorado beetles in the field. During the spraying with "Gesarol," larvae of the beetles which were ready to pupate fell to the soil and burrowed in it. Müller took a shovelful of this soil to his laboratory, and to his surprise all the larvae were dead the next morning. Inasmuch as they had not eaten any of the sprayed leaves, "Gesarol" could not have acted as a stomach poison. In this way the contact properties of "Gesarol" were discovered.

The results of these and other tests were so favorable that Müller applied for a patent on the insecticidal use of DDT in Switzerland on March 7, 1940, and on June 16, 1943, patent No. 226,180 was granted him. In his application for a United States patent, filed March 4, 1941, Müller states that DDT is toxic to houseflies, clothes moths, aphids, caterpillars, and Colorado potato beetle larvae. Accounts of the early Swiss work with DDT as an insecticide were published by Wiesmann (147-153) in a series of papers beginning March 28, 1942 and also by anonymous (1, 2) writers in 1942, 1943, and 1944. The DDT products "Gesarol," "Gesarex," and "Gesapon" were tested against the following insects: Codling moth, various webworms and budworms, thrips, prune aphid, fruit-tree borer, raspberry beetle, tortoise beetle, asparagus beetle, Colorado potato beetle, apple blossom weevil, raspberry blossom weevil, graft weevil, wireworms, May beetle, fruit tree bark beetle, winter moth, ermine moth, diamond back moth, plum tortricid moth, eye-

spotted bud-moth, European vine moth, cabbage white butterfly, clothes moth, honeybee, sawflies, onion and cabbage maggots, housefly, stablefly, carrot rust fly, and others. The toxicity of DDT to lice on horses was demonstrated by Schmid (127) and Schneider (128), who reported their results in May and November 1943, respectively.

Commercial insecticides containing DDT were offered for sale in Switzerland by J. R. Geigy A.-G. early in 1942, as evidenced by an advertisement of "Gesarol" which appeared in the *Schweizerische Zeitschrift für Obst-und Weinbau* of March 14 of that year.

Messerli (106) and Suter (134) discussed the toxicity of "Gesarol" to honeybees, and Thomann (135, 136) described tests in which "Gesarol" applied either as a dust or as a 2 per cent spray was effective against cutworms on tobacco and corn.

Wiesmann and Fenjves (153) made laboratory tests with DDT on the winter moth, the Angoumois grain moth, and the northern house mosquito. Insects in petri dishes bearing a dry deposit of this material made violent movements and cast a number of legs. Within a few hours they became paralyzed and died. It was concluded that contact of the tarsal sense-organs with the deposit irritated the nerves of the legs and also the locomotive center so severely that the legs were discarded in an attempt to escape the source of irritation, and this irritation was the cause of paralysis and death.

Work Done in England

MORE publications on DDT have appeared in England than in all other foreign countries. Although many of these papers are anonymous (3-9, 11, 13, 40, 61, 88, 89, 93) popular accounts of the subject, much work on the chemistry and insecticidal testing of DDT has been reported. Moreover, some excellent reviews of the information on DDT have been published in England, for example, those by Chambers, Hey, and Smitt (59, 60) Campbell and West (49-53, 55, 140, 142), and Heilbron (86).

The first printed statements concerning DDT to appear in England were the two patents, Nos. 547, 871 and 547, 874, issued September 15, 1942, covering emulsions and powders containing this insecticide. These patents were assigned to J. R. Geigy A-G., Basel, Switzerland (78, 79).

Martin, Stringer, and Wain (103) tested DDT and compounds closely related to it against cabbage worms, the European earwig, and woodlice. They found that 0.01 mg. of DDT would kill a cabbage moth caterpillar, or that 1 ounce would kill about 3 million caterpillars if such a collection could be made. Martin and Wain (104) proposed an hypothesis on the mode of action of DDT in killing insects, namely, that DDT penetrates into an insect because of its high lipoid solubility (a property conferred by the chlorophenyl groups) and then splits off hydrochloric acid, which kills the insect. These workers (105) have also discussed the possible uses of DDT in horticultural pest control.

Munro (111), after reviewing the use of DDT against lice, flies, and bedbugs, stated that it will not displace all other insecticides, and that further research on methods of using it should be carried on.

Chambers and Hey (58) described their tests with DDT for the control of the apple blossom weevil. A proprietary insecticide containing DDT applied twice as a spray caused a large reduction of infestation without damaging the trees. Seabrook and Sons (129) confirmed this finding. Chambers, Hey, and Smitt (60) also found that DDT gave good results against the grain weevil, the tomato moth caterpillar, the winter moth caterpillar, earwigs, flea beetle, and sitones weevil, but was ineffective against the apple sawfly.

Robinson (119) reported that DDT killed only one-tenth of the argasid ticks, *Ornithodoros moubata* (Murray), in 3 days, whether applied alone or as a 5 per cent solution in oil. Pyrethrum was the most toxic material tested. This tick is the vector of relapsing fever in Central Africa.

The amazing residual action of DDT sprays, originally observed in Switzerland by Wiesmann (148-149) where he sprayed stable walls with an aqueous suspension of "Gesarol," has been utilized by English chemists who have mixed DDT with paints. Campbell and West (54, 56, 57, 141) found that when DDT is incorporated in an oil-bound water paint it continues to exert its insecticidal action. A room was coated with such a paint containing only 0.5 per cent of DDT, and it was found that 90 per cent of the houseflies placed in the room were killed overnight. These results were confirmed by tests in a factory canteen painted with this same material. A British patent covering this invention has been applied for. Popular accounts of DDT paints have appeared in both British and American trade and scientific journals (32, 41, 74).

(To Be Concluded)

Literature Cited

(All references are to 1944 publications unless otherwise indicated.)

(1) ANONYMOUS. Das Gesarol Spritzmittel im Obstbau. Schweiz. Ztschr. f. Obst. u. Weinbau 51(10): 234-235. May 9, 1942.

(2) —— Pflanzenschutz. Tech. Indus. u. Schweiz. Chem. Ztg. 26: 128-129. May 1943 (Abstract in Chem. Zentbl. 114(II): 458. 1943.)

(3) —— Battle with typhus in Naples. Spread of epidemic. The Times (London), Jan. 15, p. 3.

(4) —— Fight against typhus in Naples. Allied doctor's success. The Times (London). Feb. 22, p. 3.

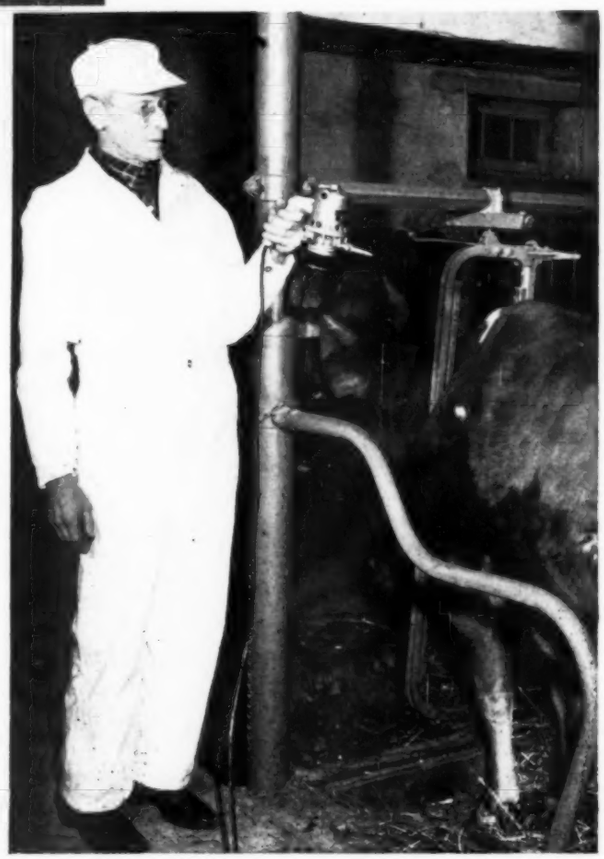
(Turn to Page 57)

These pages illustrate methods of applying various types of insecticide sprays to dairy cattle and their surroundings. Certain precautions are to be observed in handling and dispensing insecticides, while approved methods of procedure reduce all hazards to a minimum. All photographs in this feature by courtesy of Hercules Powder Co., Wilmington.

ABOVE: Protecting cattle from insects by use of residual-type spray on ceiling and walls. Flies and other insects coming in contact with this film for several months after application, will be killed. Knapsack or garden type sprayers are better than the atomizer-type for residual sprays.

•

RIGHT: Correct method of dairy cow spraying: hold nozzle about two feet from the animal to gain even distribution of spray. Electric powered (as shown) or hand operated sprayers which mix air with spray in nozzle break insecticide solution into small droplets to secure uniform spray.



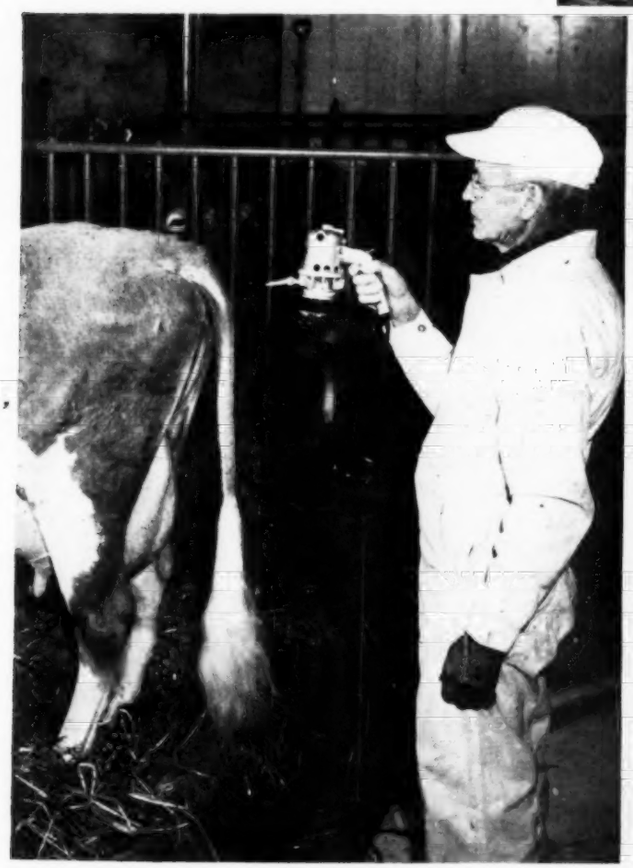
RIGHT: Holding the nozzle of the sprayer closer than two feet from the animal may result in driving too much of the spray through the hair onto the hide, causing uneven distribution and skin irritation.

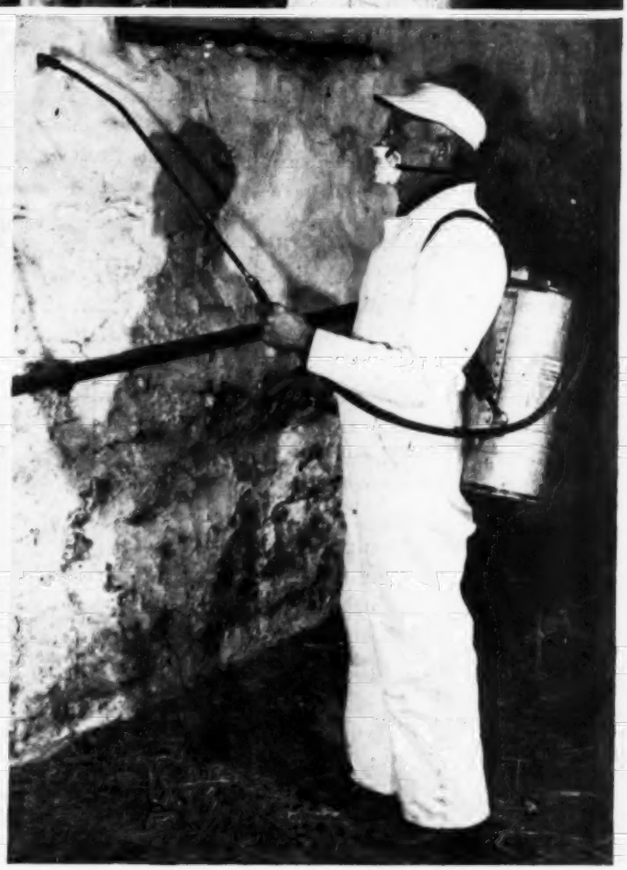
•

BELOW: Spray should be applied lightly over every part of the animal except udder and face. One and a half ounces of insecticide per cow per day is usually sufficient. More may cause skin irritation or burning.

•

BELOW (RIGHT): When spraying residual-type DDT barn sprays, a mask is advisable to protect against inhaling. Insecticide applied with this type of sprayer penetrates hard-to-reach rough spots in walls and ceilings.





Plant Hormones

Part II

By Milton A. Lesser

Part I last month gave history of plant hormones. This article (Part II) explains in detail some of the uses which make them valuable in agriculture.

TESTS on combinations of fruit drop sprays and other commonly used spray materials indicate that substances like naphthaleneacetic acid are compatible with all such materials except those containing lime.(29) It is not surprising, therefore, to find that various combination sprays containing both plant growth substances and insecticides or parasiticides have been described in patent sources.(30) Of pertinent interest is work (31) which indicates that dusts containing 5 p.p.m. naphthaleneacetic acid, 0.5 per cent rotenone and 0.2 per cent pyrethrins increase the yield of wax beans. Various other advantageous combinations of plant hormones and plant-helpful materials have been developed in the last few years.(32-35)

While various applications of plant hormones have been mentioned, consideration of specific uses will indicate the ways in which these materials have forwarded agricultural science and methods. Perhaps the most firmly established use of plant growth regulating substances is to stimulate the rooting of cuttings. Although cuttings from most species of plants have a tendency to produce roots, this tendency may be accelerated in many cases by the proper application of hormones. Response to treatment with growth substances is noted in an increased number of cuttings which root, an increased number of roots and amount of rooting per cutting, and a speeding up of the rooting process.(7) Although a few species fail to respond to or are injured by such treatment, the fact remains that the great majority of species tested have shown improvement following suitable treatment.

The economic aspects of such treatment have been aptly summarized by Mitchell and Rice(9) in the observation that, "It is desirable that cuttings establish roots quickly, not only because time and space are saved, but also because vigorously growing roots are more resistant to disease than less vigorously growing ones, and thus there is a better chance to develop suitable plants." Also to be noted is the fact that hormone treatment extends the season during which cuttings can be made.

Various methods may be used to treat plant cuttings. The most widely employed procedure is to permit the lower ends of the cuttings to stand in an aqueous solution of the active substance for a suitable period of time. Another widely used method is to wet the basal end of the cutting and dip this portion into a dust (e.g. talc, soybean flour, powdered charcoal) containing the growth regulator. Improved rooting may also be obtained by spraying the cuttings after they have been planted in the rooting frame; emulsion sprays being especially suitable.

Sometimes it is advantageous to treat the attached stems of plants by applying a ring of paste containing the growth regulator. Very useful for plants that are especially difficult to root, pastes for "ringing" are usually made with lanolin as the base.(9, 36)

Several plant hormones are suitable for stimulating cuttings. Indolebutyric acid is often employed, (6, 37) but indoleacetic acid and naphthaleneacetic acid also find frequent use.(7, 38, 39) However, whatever plant hormone is used, it must be remembered that the concentration requirements will vary with the species. Thus, cuttings from herbaceous plants root more readily than do those from shrubs or trees. As a rule, stronger treatments are required for woody cuttings.

ALTHOUGH introduced commercially as recently as 1940, each year more fruit growers are learning the advantages of hormone-containing sprays for the control of fruit drop. In Batjer's (40) comprehensive report on this phase of plant hormone utility, it is pointed out that losses resulting from preharvest and harvest drop have long been a serious problem of apple and pear growers. As the fruits approach picking maturity they tend to loosen from the spur and large quantities may drop before and during picking. Such fruit is badly bruised and even if it is salvaged it has a low value as compared with fruit picked from the tree. This tendency for fruits to loosen and drop as they approach proper picking maturity has often led orchardists to advance the picking dates, even at the risk of obtaining fruit with reduced color, smaller size, and poorer storage qualities.

In 1939, a group of workers (41) showed that by the use of sprays containing small concentrations of plant hormones it was possible to inhibit abscission and thereby effectively retard the preharvest drop of apples. Subsequently many investigations, to say nothing of practical application on millions of trees, proved the efficacy of the method.

Time of application is considered the most important single factor in the success of harvest sprays, but thorough coverage to reach the fruit stems is likewise essential. As a general rule the sprays are most effective when applied at the very beginning of the harvest drop. With proper timing and thorough coverage, a single application will usually suffice. However a second application is advised for some varieties of apples and in cases where exact timing is difficult. Providing equally effective action in retarding fruit drop, alpha-naphthaleneacetic acid, alpha-naphthaleneacetimide and the sodium salt of naphthaleneacetic acid all find use in making the requisite solutions. The chemicals are usually dissolved in alcohol prior to addition to the water. Hormone-containing dusts have also been tried. In some cases effects comparable to sprays have been obtained, (42) but Ruth's (43) work indicates that sprays give better results.

Hormone sprays also prevent preharvest drop of pears. The methods, materials, timing and other factors are essentially the same as for apples. Similar materials have given variable results with stone fruits. However, a significant reduction in drop has been obtained with apricots, (44) but similar benefit has not resulted with peaches.(40)

The conveniences and economies deriving from the development of seedless fruits have long been appreciated. A decade ago, it was reported (45) that seedless fruits could be produced by applying growth substances to the unpollinated flowers. Since that time it has been possible to successfully produce seedless tomatoes, eggplant, peppers, cucumbers and squash. Indicative work has also been done on seedless watermelons. Most workers have been particularly interested in tomatoes and much of the pertinent data have been obtained with this fruit.

Several methods are used for inducing seedless tomatoes and other seedless fruits. Among the most commonly used are treatment of the excised stile of open flowers with a lanolin preparation or spraying the open flowers with aqueous solutions or emulsions of the hormones. Of growing importance, however, is the vapor method of treatment, or more particularly its modification, the aerosol. Quite a long list of synthetic hormones are suitable for this purpose, but some are superior to others. According to Zimmerman and Hitchcock (10) the following are particularly effective: 2-chlorophenoxyacetic acid, 2,4-dichlorophenoxyacetic acid, 2,5-dichlorobenzoic acid, and beta-naphthoxyacetic acid.

The fact that the same substances which accelerate growth in low concentrations will inhibit growth when the proportions are large enough has been used to good advantage by plant physiologists. It is frequently important to prevent buds of tubers, bulbs, corms, cuttings, and trees from growing, as for example during storage. As remarked by Zimmerman, (6) following treatment with growth substances, potatoes can be stored indefinitely without much shrinkage, and fruit trees can be prevented from flowering until the danger of frost damage has passed. The same sort of treatment may be used to delay the flowering of trees and thereby spread the fruit crop over a longer period and permit more efficient harvesting. There is evidence that the flowering period for ornamental shrubs can be regulated to some extent by such inhibitory treatment.

Several methods may be employed to obtain these inhibitory or delaying effects. These include dipping, spraying, dusting and exposure to the vapors of plant hormones. A number of investigations (6, 46-50) indicate strongly that naphthaleneacetic acid and its various derivatives are especially useful for this kind of plant treatment.

Increased Yields?

THE value of treating seeds with plant hormones to increase crop yields is a controversial subject. A number of favorable reports have been published, (51-54) but these are counter-balanced by other studies which indicate that such treatments are of little practical value insofar as improvement or increase in harvest is concerned.(6, 55-58) Although commercial preparations for treating seeds are available, it would seem that this is a phase of plant hormone utility where further evaluation is needed before final conclusions are reached.

A comparatively new and obviously valuable use for plant hormones is their employment as selective weed killers. Although 2,4-dichlorophenoxyacetic acid (2,4-D) has taken the limelight, other growth substances are also useful in this connection.(59, 60, 61) This phase of utility, however, is a story that warrants a more detailed telling than can be given here.

Although plant hormones have already proved their value in many aspects of plant control and plant

(*Turn to Page* 56)

Standardized Dependable Rohm & Haas Products Serving Agriculture

COPPER OXYCHLORIDE: a copper compound particularly adapted for dust formulas for home gardens.

CUPRO-K: fungicide for use in sprays and dusts to control cherry leaf spot and other fruit diseases. Also recommended for Bordeaux-sensitive vegetables such as cucumbers, muskmelons and tomatoes.

25% DDT EMULSION CONCENTRATE: for dilution in water for use as residual action sprays, animal sprays and dips, and crop sprays.

D-30 SOLUTION: a 30% DDT concentrate for use in fly sprays and residual-action sprays.

DDT TECHNICAL GRADE: has setting point of 89°C min. For use in all types of DDT insecticides.

D-50 DUST: 50% DDT concentrate for use in agricultural dusts and powder insecticides.

D-50 WETTABLE POWDER: a 50% DDT water-dispersible powder for use in agricultural, livestock, and residual action sprays.

DITHANE D-14: water soluble thiocarbamate fungicide, used in combination with lime and zinc sulfate for control of early and late blight on potatoes, tomatoes and celery, blue mold on cabbage, and certain other diseases of truck crops and ornamentals.

HYAMINE 1622: quaternary ammonium salt for use in products for disinfection and sanitation of dairy equipment. Also recommended for veterinary disinfectants and other specialty uses.

HYAMINE 3258: water-soluble quaternary ammonium pentachlorophenate, combining the anti-fungal properties of the quaternary ammonium salts with those of the chlorophenates. Recommended as a mildew-proofing agent for leather and fabrics, general household use and food storage.

LETHANE A-70: organic thiocyanate liquid insecticide concentrate for use in powders for control of roaches, ants, bed bugs, silverfish, and certain other insect pests.

TOXICANTS FOR CROP INSECTICIDES

LETHANE 60 — LETHANE B-72
D-50 DUST
DDT TECHNICAL GRADE
LETHANE A-70 — LETHANE B-71
25% DDT EMULSION CONCENTRATE
D-50 WETTABLE POWDER

TOXICANTS FOR BARN AND LIVESTOCK INSECTICIDES

LETHANE 384 — LETHANE B-71
D-50 WETTABLE POWDER
D-50 DUST
LETHANE 384 SPECIAL
D-30 SOLUTION
25% DDT EMULSION CONCENTRATE

FUNGICIDES

DITHANE D-14 — YELLOW CUPROCIDE
CUPRO-K — COPPER OXYCHLORIDE

EMULSIFIERS, SPREADING AND WETTING AGENTS

TRITON B-1956 — TRITON X-100
TRITON X-45 — TRITON X-155
TRITON X-166

DISINFECTANT AND MILDEW-PROOFING CONCENTRATES

HYAMINE 1622 — HYAMINE 3258

LETHANE B-71: organic thiocyanate powder insecticide concentrate for use in agricultural dusts, flea and louse powders, and related products.

LETHANE B-72: organic thiocyanate powder insecticide for use in spray applications in control of aphids, thrips and certain other sucking insects.

LETHANE 60: organic thiocyanate liquid insecticide concentrate for agricultural dusts and sprays, especially in combination with pyrethrum and rotenone and other specialized insecticide formulas.

LETHANE 384: organic thiocyanate liquid insecticide concentrate for use in household and livestock sprays, aerosols, and related products—noted particularly for fast action, repellency, stability, uniformity and economy.

LETHANE 384 SPECIAL: an organic thiocyanate liquid insecticide concentrate for use in household insecticides —recognized for its fast action, stability, uniformity, mild odor, and economy.

TRITON B-1956: phthalic glycerol alkyd resin for use as emulsifying agent in oil-base mosquito larvicides, dormant sprays, summer oil-sprays for fruit, and as a spreader and depositing agent for use with fruit and vegetable sprays.

TRITON X-45: alkylated aryl polyether alcohol; an emulsifier and detergent, more soluble in oil and less soluble in water than Triton X-100. It is less expensive than Triton X-100 and is suggested for oil sprays in agriculture.

TRITON X-100: alkylated aryl polyether alcohol for use as an emulsifier for DDT solutions, plant-spray formulations, and other insecticidal compositions.

TRITON X-166: dry emulsifying, wetting and dispersing agent for use in the manufacture of wettable sulfur and other dry insecticides and fungicides to be used as suspensions — suggested for household scouring powders.

TRITON X-155: alkyl-phenoxy polyethoxy-ethanol for use as an emulsifier in solvent solutions of Rhothane or DDT, plant sprays and other insecticide formulations.

YELLOW CUPROCIDE: electrolytic copper oxide fungicide for use in agricultural sprays and dusts and as a seed treatment.

Branch offices: Chicago, Kansas City, Los Angeles, Oakland . Canadian Distributor: P. N. Soulen & Co., Ltd., Montreal and Toronto.

ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Manufacturers of Chemicals including Synthetic Insecticides . . . Fungicides . . . Plastics . . . Enzymes . . . Chemicals for the Leather, Textile and other Industries

Use of DDT in LIVESTOCK SPRAYS

by Dr. H. S. Telford*
and Dr. James E. Guthrie
Dr. Hess & Clark, Inc.

TO attempt to summarize completely existing data on this subject is almost impossible since the field is so broad and so fast moving that a summary complete today becomes antiquated within a short time. In the following report no claim is made for completeness. It is believed, however, that the papers cited will give a fair cross section of the type of research being done and will facilitate formulating recommendations on DDT. A paper summarizing existing data on DDT relating to veterinarians has recently been published by the Division of Veterinary Medicine of the University of Minnesota.[29]

Residual Barn Sprays

Since the original work of Weismann[75] in Switzerland on the use of DDT for control of flies in stables, numerous short accounts have appeared in U. S. technical and popular journals.[10, 11, 34, 41, 45] Recommendations emanating from the public service agencies on the optimum DDT concentration vary from 0.1 per cent to 5.0 per cent. Reports also on the period of efficacy are highly variable. These inconsistencies may be due in part to the wide range of conditions under which the observations were made. Important factors considered here, are: Type of formulation; proximity of sources of fly infestations, such as manure piles, garbage heaps, etc.; methods of application; season of the year; rate of dust accumulation on sprayed surfaces; character of surfaces receiving the spray; etc.

Much is desired on precise instructions on the types of sprayers and nozzles to use and the optimum pressure to employ. Undoubtedly much waste of materials and unsatisfactory results will prevail when spraying units designed primarily for specific horticultural uses are employed without further modifications for residual DDT spray application. It is the writer's opinion that a better job will be realized with more economy of materials when low pressures are employed (50 to 75 pounds), application being made with a nozzle throwing a ribbon-like spray. The Bureau of Entomology recommends a suspension of 2.5 DDT, or emulsions or solutions of 5 per cent.[17, 63] DDT-whitewash combinations are not generally being recommended although little critical work has been done. British workers[8] claim that a decomposition product (4(chlorophenyl) dichloroethylene) is produced when DDT is mixed with whitewash.

Sprays and Dips Against Flies Attacking Livestock

Following the initial work of Wels,[74] and Blakeslee,[10] DDT has been extensively employed experimentally on livestock for fly control. DDT concentrations as sprays or dips have varied from 0.1 to 5.0 per cent. Here again period of efficacy is variable, due in part to the factors mentioned above. Because of the comparative safety of wettable powders and emulsions these formulations are most popular at the moment. DDT solutions are not recommended, due to their possible cutaneous absorption and potential toxicity to animals. While straight DDT sprays have given phenomenal results against the horn fly, a knockdown agent may be necessary to obtain relief from stable flies during the milking period.[11] Perhaps the biggest innovation along this line is the practical use of fly sprays for range cattle,[5, 32, 40, 49] a practice heretofore of questionable value. Control of the buffalo fly (*Lyperosia exigua*) an insect similar to our horn fly has been achieved in Australia for a period of two weeks after treatment.[33]

As yet, DDT holds little promise against tabanids,[4, 17, 20, 22, 63] ox warbles[17, 65, 39] and horse bots.[70] The success of DDT against mosquitoes which are often a menace to livestock is well known. The Bureau of Entomology prefers a suspension applied as a spray on the animals at the rate of 2.5 per cent DDT, or as dips at 0.25 per cent DDT.[17, 63]

Screwworms and Fleeceworms

Of particular interest is the possible use of DDT to control certain livestock insects and ticks which may cause wounds favoring screw-

* Presented before Insecticide Scientific Committee, NAIDM, French Lick, Ind., June 16, 1946.

worm attack. Annand[2] states "Screwworm infestations occur in wounds caused by horn flies. Sprays with DDT for the control of horn flies attacking beef cattle under ranch conditions have greatly reduced the fly populations, as well as the number of severe infections caused by bites of large numbers of flies on small areas under the belly, about the rump and at the base of the horns."

As a treatment against larvae of screwworms and blowflies DDT holds little promise. Its greatest value will undoubtedly accrue by preventing strike in animals. English workers[6, 15, 26] reported excellent protection in sheep by spraying with 0.5 percent DDT or 0.5 per cent "666" (33 per cent gamma content). They further found that flies alighting upon sprayed sheep did not complete oviposition, presumably dying before this was accomplished. These workers are now investigating the possibility of using attractants on DDT-treated sheep so that the animals may serve as a trap for the flies. A smear containing 20 per cent DDT and a 10 per cent dust was employed by Dr. Parish for treatment of wounds of 5-day-old screwworms. Both the smear and powder protected the wounds against reinfestation for 21 days. These DDT wound preparations were less effective than U. S. Smear 62.[17]

Exhaustive tests in many countries add much to our total knowledge of Dichlorodiphenyltrichlorethane, an insecticide known the world over.

Sheep Ked or Sheep "Tick" (*Melophagus ovinus (L)*)

Recent research[14, 27, 42, 52, 55] indicates that DDT is a very effective insecticide against shep keds both as a dip and as a spray. Concentrations employed in these investigations vary from 0.1 to 1.0 per cent. Generally when dips are employed a lower DDT concentration is indicated. Spraying sheep for tick control is a highly effective and rapid method for the eradication of these parasites. High pressures must be employed to assure adequate penetration into the fleece of the animals. It has been reported[42] in large scale field tests with 0.15 per cent DDT that a few ticks survived. Since a suspension was employed as a dip in this instance it was believed that the fleece of the first part of the flock strained out large quantities of DDT.

Shull[55] indicated that a 0.25 per cent DDT suspension sprayed upon animals, also controlled "wood ticks" prevalent in Idaho. He has developed an automatic spraying chute which will effectively treat 1200-2500 sheep per hour.[25] Matthysse[38] developed an ingenious method for the control of shep keds in winter when dips and sprays are not advisable. The device is a power operated duster with discharge units arranged in a battery. The animals are driven through the insecticidal fog. His results indicated that while a dust composed of 1 part ground cube root (4.8 per cent rotenone), 10 parts *Pyrax* with 2 per cent No. 10 motor oil added, gave very good control. 5 per cent DDT in *Pyrax* was unsatisfactory. The mode of action of various toxicants (including DDT) in sheep dips has been extensively investigated in England[12] on the tick, *Ixodes ricinus* L.

Chicken Lice

DDT dusts at concentrations of between 0.5 and 10.0 percent, applied directly upon infested birds, have proven successful against the common species of lice,[17, 67, 68, 73] although Warren of Kansas concluded that DDT was no better than the standard sodium fluoride treatment. Preliminary research indicates also that dusts and sprays applied either on the floors, roosts and nests, or upon the birds, will become a common practice in the poultry industry.[69, 70] DDT is considerably less toxic to warm-blooded animals than is sodium fluoride, the insecticide most commonly employed in the past. It is also less irritating to the operator. Flock spraying or dusting with DDT may supplant, in a large measure, the roost paint treatment with nicotine sulfate.[69]

Incidentally, there are a few reports of mice being controlled in poultry houses following treatment with DDT.[18, 31] Internally dosing chickens with DDT was ineffective, while excellent results were achieved with a dip of 0.03 percent DDT content.[69]

Chicken Mites (*Dermanyssus Gallinae* (*DeGeer*))

Claims both for [18, 48, 59] and against[60, 71] the control of this pest with DDT. have been made. Perhaps there are more investigators claiming unsatisfactory control, than there are those who claim success. The writer has found 2.5 percent DDT emulsions applied as sprays to be effective, but extremely slow to act, since they required from 2½ to 3½ weeks before successful control could be realized. A 2.5 percent DDT-kerosene solution tested in the laboratory and under field conditions proved highly effective and relatively quick acting. This formulation readily penetrated the cracks, crevices and dry droppings, thus reaching the hiding mites. The depluming mite (*Cnemidocoptes gallinae* Railliet) has been successfully controlled by DDT.[24, 66] In California,[50] it was found that DDT was

less effective against the Northern fowl mite (*Liponyssus sylviarum* C. & F.) than the standard treatment with nicotine sulfate. The tropical rat mite, *Liponyssus bacoti* Hirst, is probably unaffected by DDT.[16]

Mange Mites (*Sarcoptest, Psoroptes, Demodex* and *Chorioptes*)

Here again there is considerable controversial literature, although DDT generally has proven unsatisfactory against these parasites. Experience with DDT powders against sarcoptic mites affecting army personnel indicate that very poor or no control was obtained.[13, 28] Perhaps one of the biggest difficulties encountered is the need for a suitable carrier for DDT. These parasites are for the most part imbedded in the skin of their hosts. Thus when DDT is applied as a powder, it probably does not come into sufficient contact with the parasite to be effective. High concentrations of DDT in emulsions, ointments and solutions are discouraged, due to their potential toxicity. Some of the successful reports include those of Elmes [19] against both *Psoroptic* and *Sarcoptic* mange in rabbits with a 5 percent DDT acetone solution, and Moore[43] with a 5 percent DDT powder against sarcoptic mange of dogs. Reports on "666", benzyl benzoate and tetraethylthiuram monosulfide (Tetmosol) indicate that these compounds hold more promise than DDT against this group of parasitic mites. Spraying swine with DDT for the control of lice apparently does not control mange mites commonly observed on these animals.[7]

American Dog Tick (*Dermacenter variabilis* (*Say*))

This tick, a vector of the eastern strain of spotted fever, is controlled with difficulty with DDT. Apparently standard dips of ground derris or cube powders are more satisfactory than DDT against this parasite.[17]

Lone Star Tick (*Amblyomma americanum* (L))

A 5 percent DDT emulsion in limited trials has proven effective against this pest, although 20 percent DDT combined with benzyl benzoate atomized upon the host was less effective.[23] Treating clothing holds little promise since this practice does not prevent attachments or engorgements. Dusting tick infested vegetation with 5 percent DDT is promising. One percent DDT dips on dogs do not kill attached larvae.[17]

Gulf Coast Tick (*Amblyomma maculatum (Koch)*)

Wounds created by the bite of this tick are an important cause of screwworm attack of livestock in the Coastal areas of the Southern states. Dove[17] states that "From about the first of August until the latter part of October approximately 85 percent of all screwworm infestations occur in injuries produced by this tick." A 5 percent DDT spray combined with a non-drying adhesive is particularly effective against this pest.[17, 40, 51]

Horse Winter Tick (*Dermacenter nigrolineatus (Pack)*)

The Bureau of Entomology reports successful control of the winter horse tick with the use of 0.9 per cent DDT in a soluble-pine-oil emulsion applied as a wash. This treatment gave protection from reinfestation for about 60 days.[17, 47]

Spinose Ear Tick (*Ornithodoros megnini (Duges)*)

Preliminary results indicate that 5 percent DDT in a nondrying adhesive formulation is promising.[51]

Fowl Tick (*Argus miniatus (Koch)*)

Parish was able to completely eradicate this pest from poultry houses with a 5 percent DDT solution.[17]

Cattle and Horse Lice

DDT powders found effective have varied from 3.0 percent to 10.0 percent.[17, 44, 56] The writer finds a powder of one percent DDT combined with a quick-killing agent, such as a thiocyanate or pyrethrum, to be very satisfactory against both the chewing and sucking lice of cattle. Sprays and dips with emulsions and wettable powders are highly effective against lice at concentrations as low as 0.8 percent.[1, 2, 3, 56] Lyle and Strong[37] found that herd treatment of dairy cattle could be very effectively accomplished with a hand duster with 10 per cent DDT. Schneider[54] in Switzerland obtained complete control of lice affecting horses after two days with a DDT formulation.

Hog Lice (*Haematopinus Adventicius Newm.*)

The Bureaus of Entomology[17] and Animal Industry[30], the Idaho Agricultural Experiment Station[57], and English workers[11] all claim excellent control of hog lice with DDT. They found that sprays and dips from 0.1 to 1.0 percent to be highly effective against these parasites. The writer has had excellent results by dusting infested hogs with a *Dobbins* hand garden duster with 1 percent DDT dust. This formulation failed to remain on the animals in sufficient quantity to control newly hatched lice however.

Goat Lice

Babcock[9] and Dove[17] report that dips from 0.04 to 0.6 percent DDT were effective against the common sucking and chewing species of lice on goats with the exception that the 0.04 percent concentration was ineffective against the blue louse (*Linognathus stenopsis* Burm.).

Sheep Bot or Nasal Fly (*Oestris ovis L.*)

The control of this pest is complicated since the only contact the adult fly has with its host is during the short period of time when it is depositing its larvae in the sheep's nostrils. Since the mucous membranes of normal sheep are in a moist condition, any insecticide placed there will probably be blanketed by these nasal secretions. The only data available on the use of DDT for the control of this pest comes from Argentina. Investigators there[53] found that DDT held little promise against this destructive pest applied in 4, 5, 10 and 20 percent powders, and in a 2 percent oily solution. It was their opinion that mucous, sera and other

(*Turn to Page* 54)

EXTENSIVE use of phenothiazine in Great Britain, as a means of controlling parasitical intestinal worms in farm animals is assuming increasing importance as the nation endeavors to get its food-growing program into full production after a six-year period of manpower shortage and lack of proper agricultural chemicals required for high-yielding farms. However, conditions appear brighter this season, particularly since many pest-control chemicals long unobtainable are now being placed at the disposal of farmers as a step toward rehabilitation of badly-depleted rural areas.

Restrictions on insecticides and pharmaceuticals have been lifted for the past 12 months, which puts the supply of these in good order throughout the isles. Most of the drug houses and chemical manufacturers handling insecticides, fungicides and anthelmintics are instructing farmers in correct usage through the medium of publicity campaigns, and the Ministry of Agriculture and Fisheries. Lecturers and film portrayals are being used extensively in this work, bringing home to the people the fact that British farms are in urgent need of repair and general overhaul particularly in the field of control of worms in domestic animals.

Heavy emphasis is put on this phase of rehabilitation by Ministry officials and commercial firms who point out that during the war many thousands of acres of England's best pasture lands became worm infested and thus rendered themselves sources of infection to cattle, sheep, kids, goats, horses and poultry. Even in normal years cattle deaths in Great Britain mount into the thousands through worm infestation, causing a direct and assessable loss to the farmer. But the years of war brought a much greater loss to British farmers whose healthy animals received worm infection from unthrifty and permanently stunted animals which used the same pasture lands.

With such a picture as a background, British agriculturalists see increasing importance in use of the anti-worm compound phenothiazine or thiodiphenylamine, $C_6H_4SNC_6H_4$. This compound, first prepared by Bernthsen in Germany in 1883, was not applied to biology until 1934, when Campbell and his associates discovered its effectiveness against culicine mosquito larvae, and a little later against codling moth larvae, grape-berry moth, Colorado potato beetle and other plant pests. Phenothiazine is available as a fine gray-green powder which slowly oxidizes when left in contact with the air, but is reasonably stable if it is kept dry and stored in a sealed container. This dye derivative is practically tasteless, possesses a sharp and irritating smell and has a low toxicity.

One of the interesting facts about the use of phenothiazine as an anthelmintic, its most important application, is that it is necessary to use it as a drench, whereas the chemical itself is strongly water repellent. This difficulty has, however, been fully overcome by adding a small quantity of wetting agent to the phenothiazine powder and normally the dispersible powder prepared for farm use present no difficulties in making up solutions.

The first indication of the value of phenothiazine as an anthelmintic was given by Harwood Jerstad and Swanson in 1938 in the United States. A little later, in Great Britain research was carried out along similar lines, the pharmaceuticals division of Imperial Chemical Industries taking a leading part in research and development work. This concern is today directing a strong sales campaign towards the value of phenothiazine as a safe means of controlling worm infestations in British domestic animals. The Nematodes are probably the most important types of worms and they are responsible for most of the serious or fatal infestations of sheep and cattle in Britain. Phenothiazine is highly effective against a wide variety of the smaller Nematodes such as are usually present in cattle, sheep, horses, kids and goats, but not pigs and pets.

Although it is fully recognized that there is as yet no really effective permanent method of rid-

• This article, prepared especially for AGRICULTURAL CHEMICALS, was written by a British authority who requests anonymity.

ding domestic animals of worms nor of preventing them from becoming re-infested, proper use of phenothiazine keeps these parasites under control and maintains the animal's health. The increase in cases of helminthiasis during the war has been mainly due to the grazing of untreated domestic animals, particularly sheep, on the same pasture. In this way, worm eggs are passed out in the faeces, quickly re-infesting the sheep and cattle. Clinical disease is always greatly increased by debilitation due to lack of proper feeding stuffs, a condition which still exists in Great Britain.

In sheep, phenothiazine is claimed to be 100% effective against the common stomach worm (*Haemonchus*) and successful against immature forms of the parasite. An efficiency of some 75% is claimed against the lesser stomach worms (*Ostertagia*), (*Trichostrongylus and Cooperia*) which cause parasitic gastritis. Maximum success is achieved by the use of phenothiazine for the treatment of the nodular worm (*Oesophagostomum*) lower in the alimentary canal, which is responsible for nodular disease. Against the large mouthed bowel worm (*Chabertia*) and the hook worm (*Bunostomum*) in sheep, phenothiazine is useful and brings about control of these parasites.

In cattle this drug is most effective against helminths infecting the true stomach (*abomasum*) and large intestine (*colon*), the common stomach worm (*Harmonchus*) the lesser stomach worms (*Ostertagia*) and (*Trichostrongylus*), the nodular worm (*Oesophagostomum*) and the hook worm (*Bunostomum*) are all attacked by the drug and readily succumb to its action. But against the lesser stomach worm (*Cooperia*), the whip-worm (*Trichuris*) and threadworms (*Strongyloides*) phenothiazine is only slightly effective.

Redworm (*Strongylus*) infestation in horses is readily countered by treatment with phenothiazine, which is given as a powder mixed with the food. The large roundworm (*Parascaris*) and the horse bot (*Gastrophilus*) are not effected to any worth while degree by the drug. Success has been achieved by the use of phenothiazine for the treatment of caecal worms in poultry which are of widespread incidence and considerable economic importance. In turkeys, this chemical prevents the spread of a protozoon parasite (*Hostomonas meleagridis*) cause of black head, probably the most serious and fatal disease of turkeys.

Recommendations of the effectiveness of phenothiazine for the control of poultry lice are based on extensive practical tests, but this particular application is hardly likely to be pressed in view of the claims made for gammexane and DDT for the same purpose.

For most farm purposes, phenothiazine is used as a drench or as a powder when mixed with the food. In either case, the availability of an easily dispersible powder enables the user to prepare simple suspensions of the drug in water or mixtures of phenothiazine with food. Phenothiazine is made available to British farmers in cartons containing 30 grammes and in tins holding 1 lb. and 7 lb. Every tin carries a 5 gramme scoop on the underside of the lid so that there is no difficulty in measuring out accurate doses. It is calculated that the cost of dosage amounts to 2½d per head for lambs; 5d per head for adult sheep; 3d per head for calves (6 months) and 1/-d per head for cattle. On the basis of 4 doses (or drenches) a year this works out at less than 1/-d per lamb and less than 2/-d per adult sheep.★★

Importance of Soil Fertility

By Harry J. Reed*

Director, Indiana State Agricultural Experiment Station, Lafayette, Ind.

AFTER a long, hard struggle, we have finished a terrible and costly world war which has so depleted America's resources that the effect of it will have a bearing on many generations to come. In common with other things vital for use in the prosecution of the war, the fertile soil of this country, our greatest and most essential resource, has been worked over-time to produce the phenomenal quantities of foodstuffs necessary to feed the peoples of the United Nations.

The American farmer has demonstrated his ability to produce in spite of material and manpower shortages. The accumulated knowledge of many decades of agricultural research and education came to the fore and paid off handsomely at a time when "know how" was a vital necessity. Now, although the war is won, the eyes of the world are again focused on our fertile corn belt, and many nations are looking to it for food. The next four months are critical ones, with the lives of millions of people depending upon how well we produce.

It is interesting to note in this food crisis that the world has had to depend upon a country which has for many years maintained agricultural colleges and experiment stations in each state, an extension service and an effective national department of agriculture. The world has had to depend upon a nation built on the principle of freedom of opportunity which has given men and women the chance to develop initiative, originality and capacity and the privilege of benefiting from these characteristics as society acquired greater wealth and higher living standards.

Fortunately for this period in history, American agriculture was relatively young and its soils responsive; but that will not always be true unless society as a whole recognizes the necessity of maintaining and improving our soil, and having it handled by an intelligent, capable, scientific and free group of farmers.

Soil Fertility Needs Boost

THE fertility level of our soils has gone down. It will go even lower this year, and it is a matter of plain arithmetic that we cannot continue pumping enormous amounts of fertility out of our soils and at the same time preserve the future security and prosperity of our country. What are we going to do about it?

We must keep in mind that two of the greatest basic resources of agriculture are land and people. The fortunes of one depend upon the other, and the welfare of our entire nation depends upon both. Technically, the maintenance of soil fertility depends upon the farmer. Experience and science demonstrate the absolute necessity of building up the organic matter in the soil. The necessity of proper drainage, good soil aeration, adequate plant food, proper land use and good farming methods are recognized if not entirely understood. Tests have been developed which enable one to determine certain plant food deficiencies as an aid to the use of commercial plant food in a more efficient manner. The soil microbiologists are giving us new fundamental facts which have a bearing upon our fertility problems. Research is constantly bringing us new and important information, but it must be translated into action by the farmer. This puts emphasis on the need for further education and the necessity for a national coordinated effort.

If a fertilizer manufacturer maintains and improves his plant, he must make money, and likewise agriculture must be profitable if adequate care is given to the maintenance of capital investment. Everything that contributes to a profitable agriculture and an alert, industrious and intelligent group of farm operators has a bearing on building soil fertility.

National policies have a direct bearing on our total fertility problem. You can't sell agriculture down the river and expect it to produce cheap food and ruin its soil in the process, just to please consuming classes and pressure groups in the city. That's Item Number One in maintaining soil fertility. The farmer must operate efficiently and produce

* Address by Mr. Reed at National Fertilizer Convention, French Lick Springs, Ind., June 11, 1946.

To help increase "Take-Home Savings"

THE Treasury Department has published two new booklets to help you and your employees realize the utmost benefit from your Payroll Savings Plan—benefits proportioned to the extent your employees add to "take home savings" by buying and holding U. S. Savings Bonds.

"Peacetime Payroll Savings Plan" for key executives offers helpful suggestions on the conduct of the Payroll Savings Plan. In addition, it quotes leaders of Industry and Labor and their reasons for supporting the Plan.

"This Time It's For You" is for distribution to employees. It explains graphically how this convenient, easy thrift habit works. It suggest goals to save for and how much to set aside regularly in order to attain their objectives. If you have not received these two booklets, or desire additional quantities, communicate with your State Director of the Treasury Department's Savings Bond Division.

See your Payroll Savings Plan through to maintain your share in America's future. It is sound economics and a powerful force for good today—and tomorrow—as a safeguard for stability and a reserve of future purchasing power—money that is kept within your community.

The Treasury Department acknowledges with appreciation the publication of this message by

AGRICULTURAL CHEMICALS

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council

his portion of the total crop on fewer tilled acres. He must return to the soil more plant food and organic matter than is consumed by growing crops.

Efficiency a Necessity

IN a state like Indiana, where we feed most of our crops to livestock, every production unit must be efficient whether it is an acre of land, a tractor, cow or a chicken. Animals convert feed into food products. The efficiency of the conversion process determines the return per ton of feed produced on the farm. A sound operating plan of farm operations is essential. Capital investment must be kept as low as possible per unit of production and operating money must be used in productive enterprise.

A sound land tenure program is of utmost importance to our soil fertility problem. Improvement is being made in landlord-tenant relations but much remains to be done and the productiveness of farms so operated will improve as equitable relationships are worked out.

So far I have tried to point out that farmers have a responsibility to society to maintain and improve soil fertility and to produce food and fiber economically and efficiently. In turn they deserve to earn enough to justify a decent living, a fair return on their investment and to maintain the basic resource of America.

Industry and society in general are affected by policies and programs which either promote or discourage a sound, permanent and profitable agriculture. We should now give thought to another important phase of soil fertility and that is the effect it has on the health of the people. Strong soils should make strong people. The food we eat is a reflection of the abundance or deficiency of essential elements in our soils. This emphasizes the importance of fertilizing our fields and pastures properly to improve the health and well-being of the people of this country. Two generations of adequate, scientific nutrition would make a great difference in the health situation of our people.

It is necessary for us all to remember that agriculture produces new wealth each year, which is the economic life blood for most rural areas in this nation. The standard of living is established by this annual contribution to the business of the nation. Not only does the fertilizer industry depend upon a profitable agriculture but so do many other great business enterprises of this country. The stake is so big that the cooperation of all forces should be directed to make life in agriculture satisfactory. ★ ★

•

Ass'n Makes Fungicide

United Date Growers Association, Coachella, Calif., has announced plans for manufacture and distribution of a new fungicide and insecticide for reducing the growth of fungus, mold and insects on maturing dates, prior to harvest. First public announcement of the new preparation was made at a Date Institute conducted by the Univ. of California, recently, when Dr. Donald E. Bliss of the California Citrus Experiment Station reported on the lengthy series of experiments he had made in developing the compound.

United Date Growers Association, a farmer cooperative organized by Coachella Valley date growers to handle the marketing of their products, has arranged for custom manufacture of the fungicide and will offer it for sale in 50-lb. sacks under a brand name. It will be made available to all date growers, regardless of marketing affiliations, a statement from the Association says.

•

Dr. T. J. Headlee Dies

Dr. Thomas J. Headlee, 69, professor emeritus of entomology at Rutgers University and former chief of the New Jersey State Agricultural Experiment Station, died June 14 at Plainfield, N. J. Dr. Headlee was long associated in mosquito control work in New Jersey, and served as consulting engineer in mosquito control for the U. S. Shipping Board during World War I. His entomological career began upon graduation from Cornell University, following which he was assistant entomologist at New Hampshire State experiment station, and entomologist at the Kansas State experiment station. He became New Jersey State entomologist in 1912. In addition to his work in mosquito control, Dr. Headlee was prominent in research work on insect control.

•

Dr. Alsterlund Dies

Dr. John F. Alsterlund, since 1944 a member of the research staff of Rohm & Haas Co., Philadelphia, died June 17. Dr. Alsterlund enjoyed a wide acquaintance in the insecticide industry and had been associated with the trade for many years. Before joining Rohm & Haas two years ago, he was with the Tobacco By-Products and Chemical Corporation of Louisville, Ky. He was a graduate of the University of Illinois, having received his degree from that institution a number of years ago.

•

Rotenone Ceiling Up

An increase of 3c a pound on imported rotenone-bearing roots and of 4c a pound on rotenone-bearing powder was announced by the Office of Price Administration a few days before its expiration. This lifting of ceiling prices effective June 18, followed the establishment of higher purchase prices in a new buying agreement between the United States Government and suppliers in South America. The new importers' ceiling became 28c a pound for roots and 39c a pound for powder, landed in the port of New York.

The prospect is said to be that no immediate change in price will be made, despite the expiration of OPA controls. A number of importers have indicated that they would continue to adhere to previous OPA ceilings.

The added cost of rotenone will reflect in the prices of agricultural insecticides to approximately the same extent that importers' ceilings are raised. Whereas importers' prices are up 12 per cent, ceilings for processors are increased 12½ per cent, and for wholesalers, 7 per cent. Cost to the consumer will average about 5 per cent for insecticide products made with rotenone as a base.

Full story of rotenone agreement in Agricultural Chemicals for May, 1946.

Experiment Station Digest

By H. H. Slawson

USE of new materials in the eradication of weeds from farm lands is receiving increased attention from agricultural experimenters according to recent reports from two New England experiment stations. Agriculturists in Maine and Massachusetts found chemical weed killers helpful in solving their problems, and the experiments brought out additional information on the subject of chemical herbicides.

Practical methods were developed last year in the Maine potato-growing areas, for killing potato vines prior to harvesting the tubers. The Maine station at Orono studied a wide variety of organic and inorganic chemical sprays and dusts with respect to their suitability for potato vine killing, as well as methods of applying them efficiently. Explaining the purpose, the station reports that while maximum yields are obtained when vines are allowed to mature, there are certain conditions under which it may be advantageous to terminate growth. Removing or killing the vines makes possible an early harvest and prevents leaf roll infection. Growth termination controls size of tubers and also acts as a frost substitute in late harvest.

Six conclusions were drawn from the tests as follows: (1) herbicides vary in rate of vine killing; (2) rate of vine killing varies with weather conditions and variety; (3) complete coverage of foliage with herbicide sprays is essential; (4) herbicide absorption by tubers is a factor to consider; (5) vine killing is effective in early harvest; (6) timing of spray must be carefully considered.

Dilute sulfuric acid, 5-10 per cent in strength, says the report, "is the most rapid killing agent yet studied." It is used extensively in Great Britain for blight control or improving seed quality, but in the United States, the report notes, it "awaits perfection of spray machinery which will resist its corrosive action." A warning is also given that because of the acid's tendency to burn clothing and flesh, it can be handled safely only by experienced men. The report says further that "Sinox" (2 gallons of concentrate to 100 gallons of water, to which is added 10 lbs. of previously dissolved sulfate of ammonia) and "Dowspray 66" (12 lbs. to 100 gallons of water, to which is added one pound of previously dissolved sulfate of ammonia) have a fairly satisfactory killing rate, although a more rapid killing would be desirable for early harvesting. Other herbicides, such as copper sulfate are too variable to be depended upon. Dusts, as a group, have not proven as satisfactory under Maine conditions as sprays. Most herbicides used for potato vine killing are of the contact type and are thought to kill tissues actually covered with spray. Some reports from growers, however, indicated that use of "Sinox" injured the tubers, as evidenced by yellowish discolorations. Greenhouse tests, however, indicated that this product does not injure the planting behavior and, because of the relatively non-toxic quantity involved would not constitute a health hazard.

Another feature of the Maine tests of herbicides was development of evidence that late blight tuber rot can be controlled by killing the potato tops with a chemical weed killer before the crop is dug. Tubers dug and put into storage while tops were still green showed a 40 per cent tuber decay due to blight, in 1943, and a 54 per cent decay in 1944.

Where "Sinox" was used to kill the tops before digging, the decay percentages were 11 and 14 for 1943 and 1944, respectively. Tubers dug ten days after application of "Sinox" showed only a 3 per cent decay in both years. These data led to the conclusion that "It is apparent that late blight tuber rot can be greatly reduced by killing the infected tops before the crop is dug."

"It is not safe," adds the report, "to harvest the potato crop before plants are dead, if late blight is present. The foliage may be killed by applying a chemical weed killer when maturity is delayed, or when killing frosts occur late in the season."

Aphids Also Killed

MAINE experimenters also used weed killing chemicals to exterminate plants serving as hosts to aphids which infest potato fields. Wild plum, dwarf blackthorn and wild rose were eliminated by spraying with ammonium sulfamate. Soil beneath these plants was also sterilized with borax or granular sodium chlorate to prevent seedlings from germinating from fruits not affected by the herbicide sprays. Large specimens of wild plum were killed by inserting such chemicals as blue vitriol, sodium arsenate, ammonium sulfamate and ammonium thiocyanate into holes drilled into the trunks.

Greenhouse and field experiments at Orono also indicated that annual weeds can be eradicated from grain fields by selective weed killers, such as copper sulfate, cyanamid dust and "Sinox." Effectiveness of "Sinox" was found less dependent upon weather condition and size of weeds than was the case with the other two herbicides mentioned. Clover seed with grass was severely damaged, especially by "Sinox." Although grain plants appeared injured, they made rapid recovery, provided application of the chemical was made while they were still small. Since weed seeds remain dormant in soil for several seasons, use of herbicides for a single season will not prevent reappearance of weeds the following year, the report points out. But use of herbicides is considered an effective part of the weed control program, particularly where weeds are difficult to remove, as in grain, or where infestations are heavy. Elimi-

(*Turn to Page* 56)

TECHNICAL Briefs

Recent Technical Developments in the Agricultural Chemical Field

DDT for Cattle Herds

Factors entering into the effectiveness of DDT sprays in the control of livestock flies were found by users in three western states to include the alkalinity of the water with which the insecticide is mixed, and the temperature of the place in which the spray is applied. Dr. W. T. Spencer, Regional Manager of the National Live Stock and Loss Prevention Board, Omaha, Nebr., reports the results of experimental demonstrations carried out with dairy cattle, barns, and large ranch herds. The work was done under the direction of Dr. H. Douglas Tate, Nebraska State Entomologist.

DDT applied at a temperature of 70 degrees gives a much quicker and greater knock-down and kill of flies than it does at 90 or more degrees, the experiments disclosed. The effectiveness of the insecticide was also reduced when applied on freshly painted walls, it was found. Toxicity of DDT was found to decrease when mixed with water of high alkalinity or water containing free metal, which is given as one reason why results varied in different sections of Nebraska, Iowa, and Idaho from which reports came.

These tests affirmed the residul effectiveness of DDT in freeing treated cattle from flies for periods of several weeks, despite the fact that during that time in some cases the animals were drenched in heavy rains. A Nebraska farmer relates how his cows were much quieter during this period, and because of their composure increased their milk production despite poorer pasture and excessive hot weather. Another farmer states that in a herd of cattle which had received strong applications of DDT two weeks earlier practically no flies were bothering them, while a bull which had had no DDT treatment was greatly annoyed by flies in such numbers that the farmer estimated they would fill a half gallon pail.

Spraying walls of barns and chicken houses to eliminate insect pests was reported successful, although some applications failed to kill flies effectively after a few days.

•

Chilled Soil Needs Nitrogen

Cool weather during the early growing season in New England prompted the University of Vermont Extension Service to issue instructions to gardeners regarding the need for more soluble nitrogen in the soil to aid plant growth in chilled soil. It explans how the nitrification process is slowed by lack of warmth in soil, and adds that agriculturalists may compensate for this through additions of Nitrate of soda, sulphate of ammonia or ammonium nitrate to the soil.

•

DDT Residue on Grapes

A study of DDT residues on grapes and in grape juice, made recently by D. E. H. Frear and J. A. Cox of Pennsylvania Agricultural Experiment Station is reported in the June *Food Packer*. Since DDT has been found to be effective against the grape leafhopper and the grape berry moth, it is likely to be used more widely by grape growers. The experiments were set up to determine the amounts of DDT remaining at harvest time on grapes sprayed with different spray schedules, and the percentage of DDT residues going into grape juice. The authors point out, however, that these experiments are preliminary, and the number of samples used does not warrant the making of broad conclusions.

The first two applications (June 27 and July 9) contained 2 pounds AK-40, 2 pounds copper sulfate, 2 pounds hydrated lime, and 2 quarts of dormant oil per 100 gallons. The final two applications were made later in the season with a spray containing 2 pounds of AK-40 and 2 quarts of oil per 100 gallons. AK-40 contained 40 per cent technical DDT. Plot No. 1 received all four applications, and was found to have 0.142 grains of DDT per pound of fruit. Plot No. 2 received the first three sprays, and was found to have less DDT residue than the first, 0.074. Plot No. 3 received only the first two applications and emerged with but 0.011 grains of DDT per pound. Plot No. 4 received four applications, but AKZ-40 was substituted for AK-40 and no oil was used. (AKZ-40 also contained 40 per cent DDT and was used with a spreader.) The DDT residue on fruit from plot No. 4 was found to be 0.057 grains.

Testing the DDT residue in grape juice from treated and untreated lots was more simple. The treated lot, after receiving four applications, was found to contain 1.15 DDT grains per pound in dried pomace, while not a trace was found to remain in the juice itself.

•

Penn Salt Co. Makes "666"

Experimental quantities of the insecticide, hexachlorocyclohexane, popularly known as "666" are being produced at the Whitemarsh Research Laboratories of Pennsylvania Salt Manufacturing Co. The insecticide is said to be especially effective in the destruction of most cotton insects such as the boll weevil,

cotton aphids, and cotton fleahoppers, etc. It is also effective on many of the tiny fruit and vegetable aphids which attack orchards and farmlands.

Compared to DDT, the "666" insecticide lacks the residual strength of the former, but kills certain insects more swiftly than does DDT, according to the makers. Advantages of lack of residual properties are pointed out as including the possibility of dusting with "666" before pollination, so that no trace of the poison remains after a few days, thus sparing from harm certain beneficial insects, such as honey bees.

The formula of hexachlorocyclohexane contains six atoms of carbon, six of hydrogen and six of chlorine, which accounts for the designation, "666". The product is produced by bubbling chlorine gas through benzine while powerful ultraviolet rays irradiate the mixture. Hexachlorocyclohexane, a British war discovery, is reported to be one of the most powerful insecticides yet uncovered in research.

•

Hexaethyl Tetraphosphate

A new insecticide which is claimed to have a wide field of use is announced by Monsanto Chemical Co., of St. Louis. The product hexaethyl tetraphosphate, which was developed in Germany, and brought to the attention of American scientists studying the German chemical industry after the war ended, may soon be in production by American insecticide manufacturers. It is said to be particularly effective against aphids and mites, and when used in conjunction with DDT adds to its effectiveness by killing pests on which DDT has but little effect. It is also pointed out that mites and aphids usually multiply abnormally after DDT has eliminated their natural enemies.

Hexaethyl tetraphosphate kills mites and aphids on contact, according to preliminary experiments. Although tests are not completed, indications are that the product will probably be found effective on other insect pests. It is looked upon as a possible supplement to nicotine sulfate which is scarce this year.

Fertilizers Tested

During 1945, manufacturers of fertilizers submitted 388 samples of their products for analysis by the New York state inspection service at Geneva, N. Y. Summarizing results, the annual report of the state experiment station says 94 samples were found to be deficient in plant food but not materially so. Sixty-four cases were materially below guarantee and were reported to the state Department of Agriculture and Markets for legal action. Only 73 per cent of the samples met with the claims as to potential acidity and 55 cases were reported to the department for legal action. Forty-one samples of limes were analyzed and only one failed to meet the guarantee. Of 28 samples analyzed for minor elements only three were found to be deficient.

•

Dormant Sprays for Aphids

Control of Black Cherry Aphids is generally more consistent through use of dormant sprays than from application after the buds break, according to experiments conducted at the New York State Agricultural Experiment Station, Geneva, N. Y. Mixtures consisting of 6.4 ounces of dinitro-ortho-cresol with one gallon of lubricating oil in 100 gallons of water will control this insect effectively, the station reports. This means that one pound of a DN powder or one quart of a DN paste to 100 gallons of spray mixture should be used. A later series of tests using various dinitro materials at 6.4 ounces of DN to 100 gallons without oil indicated that such mixtures also gave excellent control.

•

Wisconsin Soil in Need

Wisconsin farm soils are "getting hungry" for fertilizer, according to soil scientists at the Wisconsin state college of agriculture, who say that attention to the problem of maintaining soil fertility has been neglected during the years of stepped-up production for war demands. While the state could use 800,000 tons of chemical fertilizer, according to W. W. Clark of the agricultural extension service, only 264,950 tons were used in 1945.

Even in the best of farming areas a fertilizer deficit occurs annually, says Mr. Clark. Estimates indicate that only 75 to 80 per cent of the fertilizer materials are returned to the soil, although livestock boosts that figure somewhat.

In the average Wisconsin county, according to the soil specialist, only about 25 per cent of soil fertility is returned, in Minnesota the figure is placed at 5 per cent; in Iowa, 2 per cent and in Illinois, 12 per cent.

DDT vs Onion Thrips

DDT possesses a greater residual effectiveness than insecticides formerly used in the control of onion thrips, and is more effective than any material used in the past fifteen years, reports the bimonthly bulletin of the Ohio Agricultural Experiment Station at Wooster. In experimental work three formulations of DDT were compared: as a wettable powder, solubilized in an oil emulsion, and in a 3 per cent DDT dust mixture. The thrips were reported to be controlled equally well with each of the three formulations.

The report concludes that though DDT appears to be a practical, effective control for onion thrips, additional information on dosage, residual efficiency, spray intervals and other factors must be obtained before this insecticide can be used with complete efficiency.

A chart is given showing plant height, thrips populations, and yield following the treatments. It is presented as follows:

Treatments	*Formula*	*Plant height, August 20 Inches*	*Thrips per plant No.*	*Yield Bushels per acre**
DDT wettable powder "(Deenate 25-W)"	4 lb. -100 gal.	23.8	7	450
DDT emulsion "(Deenol)"	3 pts.-100 gal.	24.6	9	447
DDT (50 per cent) talc	6 lb. -94 lb.	21.4	63	452
Untreated		11.6	2754	268

* Of bulbs 1¼ inches in diameter and up.

Azobenzene Fumigant

Use of azobenzene as a fumigant for control of spider mite and other pests which infest greenhouse plants is described in April 1946 "Farm Research" by W. E. Blauvelt of the Cornell University Agricultural Experiment Station.

Experiments proved azobenzene to be extremely effective against both the mites themselves and the resistant egg stage. It was also noted that while many of the mites die slowly, others survive for a week or more. Subsequent experiments were made to determine concentration, methods of vaporizing, rate of vaporization, length of fumigation period, proper temperature and humidity.

•

DDT Research Needed

Before DDT can be given a clean bill of health for general use as an insecticide, it must undergo further research, is the gist of an article by Dr. Charles E. Palm in the April, 1946 edition of *Farm Research*, quarterly publication of the New York State experiment station, Geneva. Dr. Palm reviews the history of DDT, stating that up to the late summer of 1945, at which time the government released DDT, only small quantities of the chemical were available for experimental purposes. Since it was too late in the season to make extensive field use by growers, all the answers are not yet available to questions asked by the public regarding the insecticide.

However, Dr. Palm points out that work is being done in research on insect pests of fruit, market vegetables, canning crops, shade trees and nurseries, and on biological control. A group at Ithaca is working with potato insects, forage crop insects, pests of farm livestock, muck-grown vegetables, greenhouse florists' crops, household insects, and phases of laboratory testing. In the matter of livestock fly control, reports from various sections indicate promise for the use of DDT directly on cattle for control of the horn fly and the stable fly. The effect on horseflies and deerflies remains to be seen. Preliminary results with cattle lice and sheep ticks will have to be carried further under New York conditions before conclusions are drawn, says Dr. Palm.

While plant bugs, leafhoppers and aphids on alfalfa and clover can probably be controlled with DDT, the question of residues remains without a complete answer. No satisfactory methods are available for removing residues from fruits and vegetables, and as yet no official residue tolerance has been established as to toxic effects of DDT to warm-blooded animals, although an unofficial tolerance of 7 parts per million is considered safe on apples and pears.

Promise of successful use of DDT on onions for thrips control is attracting attention, as are problems relating to satisfactory methods for application and proper timing. Research is under way on leafhopper control in relation to lettuce yellows, and control of certain insects which invade florist crops is showing promise, the article says.

•

Fumigation for Wireworm

The story of how the application of soil fumigants controlled wireworm and nematodes in various parts of the country is told in a recent issue of Dow Chemical Company's employee publication, *Dow Diamond*. Efficacy of chemicals used was determined by treating portions of ground directly adjacent to untreated ground. At various points the soil was sifted and the dead and live wireworms counted in both the treated and untreated areas. Counts were also made after the regular crop had been planted in order to determine the number of plants which grew to maturity, and again to make comparisons between treated and untreated plots. Results are reported as being successful, a marked difference being noted between the treated and untreated plots. Dow announces in the article that its fumigant products are available for shallow-rooted plants such as carrots, peas, beans, cabbage, radishes, etc. for control of wireworms.

The experiments showed also control of soil-inhabiting nematodes, particularly prevalent in the southern states, but found also in most other parts of the country. In certain heavily-infested fields where yields had been only 816 pounds of sweet potatoes per acre, the marketable yield rose to 13,850 pounds per acre after application of fumigants had reduced heavy nematode population. These pests attack trees and shrubs as well as beans, cotton and other smaller crops. The particular fumigant recommended by Dow is effective also on Japanese beetle grubs and white grubs.

•

Fertilizer for Peas

Need for fertilizer in growing peas was emphasized in tests made recently at the New York Agricultural Experiment Station, Geneva, N. Y. Dr. C. B. Sayre, conductor of the tests reports that in plots where an 0-16-8 fertilizer was applied at the rate of 625 pounds per acre, larger nodules, higher yields, and better flavored fruit were noted in comparison to control plots where no fertilizer was added. Although the peas in non-treated plots were first to mature, they also had the lowest yield, and passed their prime quality much sooner than did the others. Flavor was lost through sugars changing to starch and the peas becoming tough.

•

Insect Book Available

Pennsylvania Salt Company has issued a 24-page booklet explaining the application of DDT insecticides in the home. The book discusses the habits of insects, their methods of breeding, feeding, the diseases they carry, their effect on human beings, and the proper methods of destroying such insects. Name of the booklet is "Knock Out Bugs." It is available from the company's main office, 1000 Widener Building, Philadelphia 7.

•

Chalk Line DDT

Scheduled for immediate appearance on the market is a chalk line DDT crayon manufactured by National Products Co., of Orlando, Florida. The product is described as leaving a streak of DDT insecticide wherever a line is drawn with the crayon. A patent is pending for the product. The firm is successor to National Products Corp.

Raw Material Markets . .

FACTORS involving the weather, the seasons, and economic considerations bear heavily upon the agricultural chemical market situation throughout the country. Against a background of shortages of nicotine, weather conditions favoring codling moth activity are reported from various parts of the country, along with infestations of apple aphid, black pecan aphid, black-margined aphid, grape leafhopper, and grape berry moths. Of these, perhaps most serious is the black pecan aphid infestation in northern Louisiana, termed as "heavy" by the U. S. Department of Agriculture.

In New York state the pear psylla is on the increase in the Hudson River Valley, where also weather conditions favored emergence of codling moths. Entrances of first-brood larvae were fairly common in some orchards. Presence of the codling moth was reported also in reports from Kentucky, Illinois, and Indiana.

The supply situation on other insecticides was affected badly by strikes in various fields at the time of year when demand is always heavy. With decreased production and a heavy demand, it was impossible to build up inventories, a factor which may reflect in supplies in later months. Arsenicals as a group are tight, although the supply of calcium arsenate is expected to meet 1946 requirements if an unusually heavy infestation of boll weevil fails to occur in the cotton area. First quarter reports show March production to be greater than that of February this year, but still less than half of the output for March, 1945. White arsenic is critical, with but little being imported from Sweden. That which comes from Peru is not fully refined, and part of this supply has been diverted to use as weed killers rather than insecticides.

Output of lead arsenate for 1946, already 11 per cent below the first quarter of 1945, is likely to drop further owing to restrictions on the amount of lead to be allocated for production of lead arsenate. (Limitation Order No. 354, as amended April 23, 1946). Exports of lead arsenate during the first quarter were chiefly to South America, Argentina being the principal destination. Individual export licenses are required for all foreign shipments.

Production of copper sulfate has been seriously hampered by strikes in both smelters and chemical plants, which has resulted in placing the material on the critical list. Export shipments were falling far below usual figures in March, with requests for export licenses being carefully screened. Banana growers in Central America need the insecticide for their crops, although having received a good supply during the first two months of 1946.

Prospects for immediate relief in the very tight rotenone situation appear dim, since shipments of cube left Iquitos, Peru, only in May and the time for application on vegetables will have passed before arrival of the material. Rotenone insecticide was needed particularly for peas in the U. S. Imports during the first quarter were 350,000 pounds below shipments received in the same period of 1945.

The pyrethrum picture is much brighter, with March imports hitting a high of 5,172,000 pounds, compared with slightly over 2 million pounds in March last year. Most of the imports came from Africa, where the flowers have a higher pyrethrin content than those from Brazil. Since the more potent African flowers bring better market prices, it is reported that numerous Brazilian producers are planning to plow under their stands of pyrethrum in favor of other crops bringing more income.

Shortage of coal has had its effect on production of DDT and nicotine. Producers of DDT report availability of their raw materials as being short to extremely critical, despite the fact that the March output of DDT was 20 per cent higher than during the corresponding month last year. Effects of the coal strike have decreased production of materials needed for manufacture of the finished product. The same story is largely true for nicotine, which in addition to its being affected badly by the coal strike, is also hit by a shortage of many raw materials. Individual licenses are required for exporting nicotine sulfate, but the U. S. is attempting to share its scanty supplies with other countries where the insecticide is needed to protect growing crops.

WORLD need for increased food production is taking its toll of fertilizers from the United States, and labor, transportation, and raw material difficulties have also contributed to the generally tight situation. Exports of fertilizer for the first quarter of 1946 were about 2½ times larger than those of a year ago. According to the National Fertilizer Association, exports of fertilizer and fertilizer materials in March amounted to 94,000 short tons, representing an increase of 160 per cent over March of 1945, and a 41 per cent increase over the same month in 1944. Phosphate rock, with heavy shipments to the United Kingdom, New Zealand, Sweden and Canada led in export tonnage. Declines were noted, however, in shipments of ammonium sulfate and concentrated superphosphate. UNRRA claimed 2,822 tons of fertilizer. (Counted in March figures). There were no lend-lease shipments during that month.

Imports, on the other hand, continue lower than a year ago. March, for instance, saw a 38 per cent decrease in imports as compared with the same month of 1945. Imports of sodium nitrate were shorter by 60,000 tons and those of other phospates (principally crude phosphate) were

(*Turn to Page* 62)

Report on Florida "Dithane" Tests

USE of fungicides to control the serious problem of blight in potato production is being counted upon heavily this year to help maintain a heavy yield of the crop despite a reduction of over-all potato acreage in the United States. According to tentative estimates of the U. S. Department of Agriculture, the world will raise some 11 per cent fewer potatoes this year than in the 1944-45 season. With an estimated 5 per cent less land on which to grow potatoes, the need for efficiency in raising the crop is probably greater than ever before. Heavier yields must be realized to compensate for smaller planted areas.

A possibility for help in this situation is offered through use of a new synthetic fungicide, disodium ethylene bisdithiocarbamate marketed under the trade name "Dithane" by Rohm & Haas Company, Philadelphia. Applications of this product in large-scale potato-growing areas for the past two seasons have contributed to control of blight and permitted heavier yields. According to the producers of "Dithane", results have been highly satisfactory in the state of Florida where a number of large-scale applications have been made, although less success was reported in commercial trials on Long Island last season.

"Dithane" was first introduced commercially in the Homestead potato-growing area of Florida. Here the 1944-45 yields of treated crops averaged more than 300 bushels per acre which represents a significant increase over previous years at which time other types of fungicides had been used. Rohm & Haas Company reports that "Dithane" not only stopped late blight on potatoes, but also did an effective job on early blight. Again during the 1945-46 season, "Dithane" was applied on more than 95 per cent of the potato acreage in the Homestead area with good success despite severe late blight conditions. Reported yields were again high with one grower claiming an outstanding mark of 519 bushels. Compared to the 12-year average of 125 bushels per acre obtained in this area prior to 1945, the current high production appears to be indicative of the need of an effective blight-preventing fungicide.

The story this year in other potato sections of Florida is reported to be equally impressive. In the Fort Myers area, for example, growers experienced trouble with late blight for the first time, but "Dithane" users, were able to control the disease and to harvest satisfactory crops. Much of the Belle Glade area suffered from the early season hurricane, but the remaining acreages produced large yields with the help of the disodium ethylene bisdithiocarbamate product.

Florida's largest potato acreage is in the Hastings area. For many years dust fungicides have been used in this area for the control of blight. In 1945-46, several large growers procured spray rigs in order to use "Dithane" for the first time. In spite of late blight, these growers had significantly higher yields than neighbors using other fungicidal dusts, according to Rohm & Haas Co.

Last year in Maine, "Dithane" was used on a large commercial acreage for the first time, although it had been tested experimentally in previous seasons. Yields from the "Dithane" sprayed acreage exceeded those from acreage treated with other fungicides by an average of 60 bushels per acre, the makers of the product report.

Maine growers are faced each year with the problem of leaf-hoppers, flea beetles and Colorado potato beetles, in addition to blight. Last year DDT proved itself capable of solving the insect problem, and when mixed with "Dithane", the combination enabled growers to control both the plant disease and insects. The two products mix readily together without destroying the effectiveness of

(*Turn to Page 65*)

Below (left): Field of potatoes in the Hastings area of Florida, almost completely ruined after late blight had done its work. Usual methods of disease control had failed to check its advance.

Below (right): This field, located close to the blighted area, was sprayed with Dithane and kept free from blight throughout the growing season. Both photos on this page through courtesy of Rohm and Haas Co.

Suppliers' Bulletins

Insecticide Leaflet

DDT Products Manufacturing Co., Inc., Houston, Texas, has issued a pamphlet containing general statements about DDT, the laws covering it, the forms in which it is available, the oils and emulsions with which it can be sprayed properly, the legal DDT residue tolerance on food for man, and a comprehensive list of insects, in a chart telling the effect of DDT as compared to other insecticides. The material was gathered through the Agricultural and Mechanical College of Texas in cooperation with the United States Department of Agriculture, and the reprints are available through DDT Products Mfg. Co.

Plant Disease Leaflet

A leaflet (No. 139) covering the control of soil and seed-borne diseases of vegetables has been issued by the University of Minnesota Agricultural Extension Service. The publication gives a chart which recommends the seed treatment to control vegetable diseases, and the method of treatment, along with a written treatise regarding the history of various common diseases, and means of overcoming these through the application of chemicals. The booklet may be obtained from University of Minnesota Agricultural Extension Service, University Farm, St. Paul 8, Minn.

•

"D-D" Booklet by Shell

A booklet on "D-D" for soil fumigation has been published by the Shell Chemical Corp., San Francisco. The product is described as being valuable as a soil fumigant because of its toxicity towards the nematode and other soil-borne pests. The booklet points out the fact that "D-D" as a soil fumigant is a comparatively new product, and states that research is being carried out by various agencies aside from the Shell laboratories themselves. Numerous photographs illustrate how "D-D" has controlled different kinds of soil pests.

•

New Insecticide Booklet

Rohm & Haas Co., Philadelphia, has issued a new booklet, "Insecticide Formulations for Household, Livestock, Farm and Industry Use". Designed as a reference piece, the booklet presents a wealth of data with numerous charts showing various methods of pest control, and comparisons of different methods. Test results of cattle spray (oil base) are given, as is a chart on the speed of "Lethane" cattle sprays. Water miscible concentrates and a digest on reports of DDT water emulsions and sprays for use in farm and industrial buildings are examined with various concentrates described. Toxicology of "Lethanes" and DDT are compared and test methods described. The booklet also gives similar information regarding the control of household pests, and the insecticides used to accomplish this end.

INDUSTRY NEWS

New Penick Executives

Announcement has been made by S. B. Penick & Co., New York, of the recent election of Harold Noble as vice president, and John Dabney Penick as a member of the Board.

Harold Noble

Mr. Noble has been associated with the Penick Company for 29 years, and has been manager of the insecticide division since its establishment some ten years ago. Mr. Penick, a graduate of the University of Virginia in 1928, was associated with the investment banking business until July, 1942, at which time he entered the U. S. Army as a private. After two years of service, he retired last December with the rank of Major.

•

Calif. Entomologists Meet

Dr. M. A. Stewart of the Division of Entomology and Parasitology, University of California, Berkeley, was elected chairman of the Pacific Slope Branch of the American Association of Economic Entomologists at the thirtieth annual meeting at Riverside, California in June. He succeeds H. J. Ryan, of the Los Angeles County Agricultural Commissioner's Department, Los Angeles.

Other officers elected at the meeting included Dr. W. D. O'Neil of the Washington State Experiment Station, Wenatchee, Wash., vice chairman, replacing H. M. Armitage, of the State Department of Agriculture, Sacramento, Calif. Roy E. Campbell of the U. S. Bureau of Entomology and Plant Quarantine, Alhambra, Calif., was re-elected secretary-treasurer of the association.

Meeting jointly with the A.A.E.E. was the Entomological Club of Southern California which also named new officers for the year. President is William E. Landon of the California Fruit Growers' Exchange, Los Angeles, who succeeds Howard H. Wilcomb of the Los Angeles County Agricultural Commissioner's Department. New vice president is E. A. McGregor of the Bureau of Entomology and Plant Quarantine, Whittier, Calif., who replaces Mr. Landon. Secretary-Treasurer is Mr. Campbell who holds the same position in the A.A.E.E. Corresponding Secretary is A. W. Cressman of the Bureau of Entomology and Plant Quarantine, Whittier, Calif., who succeeds himself.

The gathering was attended by some 350 registrants who heard papers read on varied problems dealing with insect control as related particularly to west coast conditions. Symposiums were conducted during each of the days, covering such subjects as Biological Control, and New Insecticides and Methods of Application. Representatives of the United States Department of Agriculture in Washington present at the meeting included W. L. Popham, Assistant Chief, Bureau of Entomology and Plant Quarantine; C. P. Clausen, Chief, Division of Foreign Parasite Introduction, Bureau of Entomology and Plant Quarantine; and R. C. Roark, Prin. Chem. in Charge, Division of Insecticide Investigations, Bureau of Entomology and Plant Quarantine. Dr. Charles E. Palm, head of the Department of Entomology, Cornell University, Ithaca, N. Y., also appeared on the program.

AIF to Meet Sept. 3-5

The thirteenth annual meeting of the Agricultural Insecticide and Fungicide Association will be held at the Essex and Sussex Hotel, Spring Lake, New Jersey, on September 3, 4 and 5, according to Lea S. Hitchner, executive secretary of the association.

Lea S. Hitchner

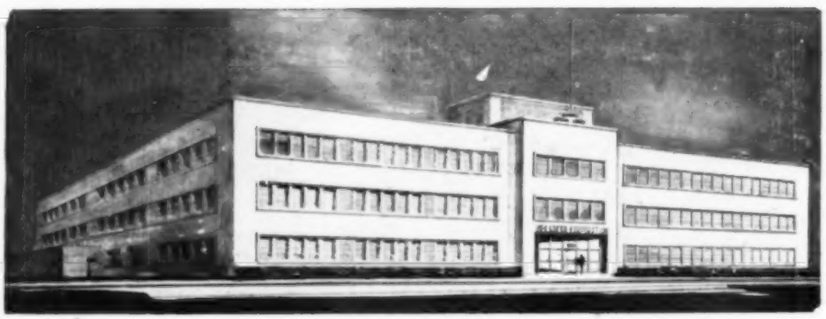
Tentative program arrangements now being made indicate a full-rounded program for the three-day session. Among the speakers are included Clifton A. Woodrum, president of the Plant Food Council, and Ray L. Cuff, regional manager in Kansas City for the National Livestock Loss Prevention Board. Full details of the meeting will be presented in the August and September issues of *Agricultural Chemicals*.

•

Plant Food Council Elects

Dr. John R. Taylor has been named agronomist and Lewis H. Wilson as director of information for the American Plant Food Council, according to recent announcement by Clifton A. Woodrum, council president. Dr. Taylor was formerly agronomist for the Virginia Carolina Chemical Co., Richmond, Va., and Mr. Woodrum was previously director of publicity for the National Grange.

New Home for Velsicol Corporation



Now under construction in Chicago is the completely air-conditioned laboratory building of Velsicol Corporation. The building will provide the most modern facilities for use of the company's research and technical staffs. Features of the new plant will be the specially equipped entomological and small animals laboratories where research on various biological problems will be conducted. A pilot plant and instrumentation laboratories are also included in the facilities. Velsicol Corp. manufactures insecticides, resins, aromatic solvents, and other chemical products of petroleum derivation.

Dr. Snell Elected

Dr. Foster D. Snell was elected president of the American Institute of Chemists at its annual meeting held May 17th in New York. Dr. Snell succeeds Dr. Gustav Egloff of Chicago as president. The new head of the organization is president of Foster D. Snell, Inc., consulting chemists, Brooklyn, N. Y.

•

Degree to Carrigan

The University of Maine, Orno, on June 16 awarded the honorary degree of doctor of laws to Dean Joseph E. Carrigan, who since 1931 has been director of the Vermont Agricultural Extension Service. The award was made by Arthur A. Hauck, president of the University of Maine. Mr. Carrigan has long been connected with agriculture, having been a county agent, assistant county agent leader, and director of the Extension Service. He was appointed dean of the Agricultural College and director of the Agricultural Experiment Station in 1942.

•

Weed Killer Booklet

Chipman Chemical Co., Inc., Bound Brook, N. J., has issued a 28-page booklet under the title, "You can't argue with weeds; you've got to kill them!" The brochure describes various types of chemical weed killers and the manner in which each works, and presents a chart of troublesome weeds common in the United States. Family names of the weeds are given with the common names. Methods of applying chemical weed killers are described in detail, with illustrations showing various types of equipment used. The booklet also lists the complete Chipman line of insecticides, fungicides and weed killers for various agricultural uses.

•

Potash Corp. Elects

American Potash and Chemical Corp. has announced that two vacancies on its board of directors have been filled by election of Robert F. Brown, a partner of Kuhn, Loeb & Co., and Rudolph E. Vogel, a partner of Glore, Forgan & Co.

•

Co-op Advertises

Farmers Union Central Exchange, St. Paul, Minn., is advertising to its local member units the availability of stocks of two new DDT-type sprays. "Co-op" household spray—5 per cent DDT, is recommended for killing flies, mosquitoes, gnats, silverfish, ants, bed bugs, clothes moths, carpet beetles, fleas and certain grain insects, while "Co-op" 25 per cent concentrate DDT for water emulsion sprays, is recommended for house and stable flies, horn flies, mosquitoes, lice and ticks.

Characteristic of the "truth in advertising" which marks all promotional statements made by farmer cooperatives about the products they offer members, is the following from a recent advertisement:

"Neither the cattle spray nor premise spray is capable of knocking insects down or repelling them. They are, however, very powerful insect killers, since the DDT residue which they deposit is able to kill insects long after the spray has been applied."

•

Weed Killer Leaflet

C. B. Dolge Co., Westport, Conn., has issued a folder presenting the merits and uses of its new "Dolge Weed Killer," said to be effective in exterminating the usual species of weeds growing on driveways, walks, parking lots, sand traps, etc., and also recommended for killing termites. One gallon, mixed one part to 40 parts water, will treat 1,250 sq. ft.

•

Fertilizer by Co-op

Southern States Cooperative, Richmond, Va., has plans under way for construction of a plant for manufacture of mixed fertilizer, to be located in Kentucky for the convenience of its farmer-members in that state. Contracts have also been let for constructing an addition to the Southern States' fertilizer plant at Norfolk, Va., to provide facilities for 20,000 additional tons of fertilizer annually.

•

N.A.I.D.M. Meeting

The National Association of Insecticide and Disinfectant Manufacturers, Inc., held its thirty-second mid-year meeting at French Lick Springs, Indiana, June 17, 18 and 19. Scheduled on the three day program were numerous addresses on, and discussions of current trends in the industry, the supply situation, and marketing considerations. Association President N. J. Gothard presided at the first day's session, while the last two days were under the chairmanship of A. W. Morrison, 2nd Vice President; and C. L. Weirich chairman of the program committee, respectively.

Dr. Ray L. Cuff, regional manager in Kansas City for the National

Livestock Loss Prevention Board, addressed the June 17th session on "Livestock Sprays," reporting on tests conducted in Kansas and Missouri with DDT sprays for protection of cattle against horn flies. Cattle sprayed in the test gained in weight on the average about one-half pound more per day than unsprayed cattle. Milk output was boosted about twenty per cent. Cost averaged about 5c per head for the season. He warned that use of oil base emulsion sprays is dangerous unless the mixing is done very thoroughly.

Two addresses dealing with the toxicity of DDT to man and animals were also presented at this session. Dr. Paul A. Neal, medical director of the Industrial Research Laboratory, U. S. Public Health Service, Bethesda, Md., presented "A Synopsis of Experimental Work on the Toxicity of DDT." Experimental studies demonstrate, he said, "that DDT can be absorbed through the gastrointestinal tract, the respiratory tract, and when in an oily solution through the skin of mammals. Dry, powdered, pure DDT does not cause irritation of the skin, in either animals or man."

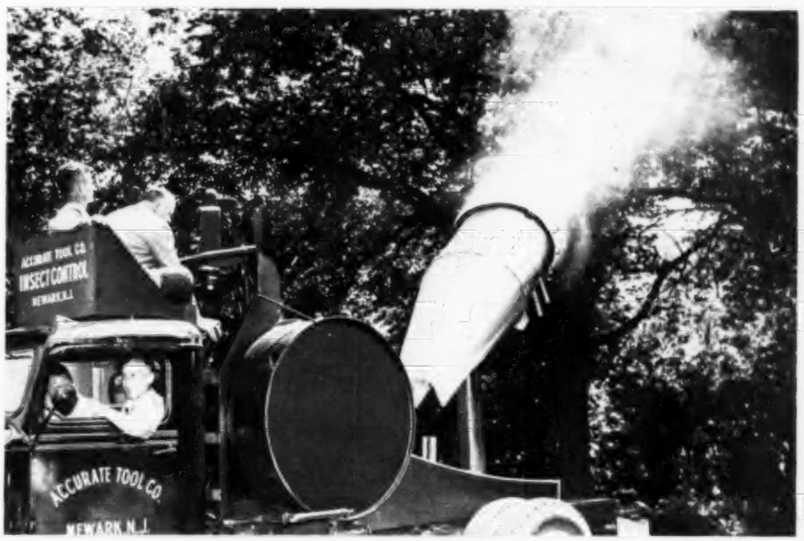
"In spite of its toxicity," Dr. Neal added, "no harmful effects have been observed in rooms containing many times the recommended insecticidal concentration of DDT in sprays and dusts. But careless use and exposure to abnormally high concentrations of DDT may cause toxic effects. . . . As with any insecticide, there are certain precautions which must be taken to avoid any possible harmful effects."

He warned that benzol and the chlorinated hydrocarbons, such as carbon tetrachloride and especially tetrachlorocthane, should not be used in the preparation of DDT insecticides. Many of the solvents commonly used in preparing insecticides may themselves cause irritation of the skin and other harmful effects if handled carelessly. He warned particularly that DDT in oil solution should never be used on the skin or coat of animals.

Turning to the subject of DDT residues on agricultural crops, he advised that the Federal Interdepartmental Committee on Pest Control is now studying the subject of allowable tolerances. He indicated that the use of DDT insecticides for certain underground crops such as potatoes and peanuts would offer practically no hazard.

Another report entitled "Toxicity of DDT Sprays on Livestock" by Horace S. Telfond of Dr. Hess & Clark, Inc., Ashland, Ohio, appears in full elsewhere in this issue. ★★

Unique Applicator Distributes DDT



"Accurate Full Universal Insect Control Unit" pointing its spray into the trees of Elmwood Park, E. Orange, N. J. in demonstration June 27. Later reports indicate nearly 100 per cent kill of mosquitoes as result of DDT applied with this machine. Spray travels with sufficient force to go completely through tree branches and descend again, thus wetting both sides of many leaves.

An almost 100 per cent kill of mosquitoes and other insects bothersome to human beings was reported following a demonstration of DDT applied by the "Accurate Full Universal Insect Control Unit" at Elmwood Park, East Orange, N. J. June 27. The spraying equipment, mounted on a 3 ton truck features a 54-inch four-blade propeller powered by an aircraft engine which rotates up to 2,400 rpm. The blast of air hurls the insecticide some 300 feet in any direction from a vertical position to the ground, or in a 180 degree horizontal arc to the rear and sides of the truck. The spraying unit is controlled by hydraulic means by an operator whose position is atop the truck's cab in full view of the area to be treated.

According to Harry E. Turner, Secretary of the Shade Tree Commission, East Orange, persons coming to the park during evenings following the demonstration were not bothered at all by insects whereas the mosquitoes previously had infested the area in such numbers that citizens could not enjoy any evening gatherings out of doors. The trees and grass were each sprayed heavily with an aqueous emulsion of DDT.

Inventor and developer of the unit is Walter Walker, president of the Accurate Tool Company, Newark. One of the obstacles to be overcome was to get a motor which could run for long periods of time at a vertical angle. This necessitated redesigning of the engine's lubrication system, which was accomplished satisfactorily. The unit carries a 550 gallon tank for insecticides and sprays at the rate of about two gallons per acre. A speed of from three to five miles per hour is the usual gait of the truck while spraying.

Witnessing the demonstration at East Orange were officials of New Jersey State, County and City Shade

(*Turn to Page* 55)

Seed Association Meets

Displays of agricultural chemicals were prominent among the exhibition booths at the 63rd Annual convention of the American Seed Trade Association held June 17, 18, and 19 in New York City. Manufacturers of insecticides and fungicides, fertilizers, weed killers, spraying and dusting equipment and fumigants were much in evidence, displaying their products to the 1,400 attendants at the meeting.

Among the companies displaying various agricultural chemicals were Acme White Lead & Color Works, Detroit; American Agricultural Chemical Co., New York; American Chemical Paint Co., Ambler, Pa.; American Cyanamid & Chemical Corp., New York; Concord Chemical Products, Inc., New York; Doggett Pfeil Co., Springfield, N. J.; E. I. DuPont de Nemours & Co., Wilmington; Gallowhur Chemical Corporation., New York; Goulard & Olena, Inc., New York; H. D. Hudson Mfg. Co., Chicago; Nitragin Co., Milwaukee; Nott Manufacturing Co., Mt. Vernon, N. Y.; Plant Products Corporation, Blue Point, N. Y.; Swift & Co., Chicago; Tobacco By-Products & Chemical Corp., Louisville, Ky.; and United States Rubber Co., (Naugatuck Chemical Div.), New York.

Association officers elected at the meeting were Stanley B. Folsom, president, Minneapolis, who succeeds Lloyd M. Brown of Chicago. Vice-president is Dr. J. R. Holbert of Bloomington, Ill., succeeding Mr. Folsom. Second vice-president is Merritt Clark of New Haven, Conn., and secretary-treasurer and counsel is Roger J. O'Donnell of Chicago.

Among the addresses given at the three-day session was "Agriculture as I see it" by Professor Asher Hobson of the Dept. of Agricultural Economics, University of Wisconsin; and "Permanent Agriculture", by John B. Kimberley of the United States Department of Agriculture. Other topics dealt with included costs, seed legislation, the association's relationship to UNRRA, flower seeds and seed production prospects.

2, 4—D applied to kill New York City weeds

Todd Fog Machine emitting blanket of 2,4-D at rear of Brooklyn Museum, near the city's Botanical Gardens. Later reports indicate that all ragweed in the vicinity had been killed, and that pollination of buckhorn had been halted by the application.

IN preparation for a campaign to rid the City of New York of ragweed and other unwanted plants which tend to impair the health of its citizens, the Department of Health has made various experiments with 2, 4-D to determine the most efficient and economical methods of weed eradication.

A test made in June, using three separate methods of application, proved successful in killing ragweed at the rear of the Brooklyn Museum, near the Brooklyn Botanical Gardens. According to reports of the Department of Sanitation, the weeds withered and died while blades of grass in the same area were not affected at all. The experiment was witnessed by New York City officials who made notes of various concentrations, costs, and methods.

The three methods of application included a knapsack sprayer, a power sprayer, and a fog machine. Each was demonstrated as being capable of performing a specialized task . . . ranging from small plots where the knapsack is useful, to large areas where power spray or fog application is desirable. The sodium salt containing about 85 per cent 2, 4-D was mixed 1 pound to 100 gallons of water for the work.

An estimated 10,000 acres of New York City is comprised of vacant lots where weeds grow unhampered, and which at certain times of the year cause misery to a large percentage of the population through contributing to Hay Fever symptoms. Ways are being sought to remedy the situation, and an interest has been shown in using 2, 4-D to eliminate the weeds.

Observers of the Brooklyn demonstration saw the Todd Fog Applicator cover large areas of ground with the chemical which was broken down into very small particles to form a cloud-like covering of the area. The machine breaks the liquid into particles about 135 microns in diameter when being used as a spray, but through use of a combustion chamber which introduces hot air to the stream, the particles are exploded

(*Turn to Page* 52)

New Trade Marks . . .

Application has recently been made to the U. S. Patent Office for registration of the following trade-marks for products in the agricultural chemical field, and the marks listed were published in May and June issues of the OFFICIAL GAZETTE. The Patent Office requires that notice of any opposition to registration of a trade-mark be filed within thirty days of publication in the GAZETTE, accompanied by a fee of ten dollars.

Trade Mark Applications

TUFF STUFF—This in capital and lower case letters, for insecticides. Filed Dec. 5, 1945, by Tom Huston, doing business as Tuff Stuff Insecticides, Miami, Fla. Claims use since Oct. 6, 1945.

ISONOL—This in spaced capital letters, for emulsifying fungicidal agent used in the agricultural and industrial fields. Filed Sept. 17, 1945, by Onyx Oil and Chemical Co., Jersey City, N. J. Claims use since March 21, 1945.

"HY-PO" — This in quoted capital letters, for liquid insecticide. Filed Dec. 11, 1945, by York Pharmacal Co., St. Louis, Mo. Claims use since Sept. 5, 1945.

BANSECT — This in capital letters, for veterinary flea and louse powder. Filed March 1, 1946, by Lederle Laboratories, Inc., New York. Claims use since Feb. 15, 1946.

STIM ROOT — In capital and lower case letters, for insecticides used for spraying plants. Filed May 21, 1945, by Plant Products Co., Blue Point, N. Y. Claims use since March 21, 1945.

OIL OF SEVEN TEMPLES — for insecticides. Filed Nov. 16, 1945, by I. Lower, doing business as Lower's Pharmacy, Marion, Ohio. Claims use since 1930.

AN ABSTRACT DESIGN of black square standing on one corner, with no lettering—for insecticides in composition form. Filed Jan. 17, 1946, by the Griffith Laboratories, Inc., Chicago. Claims use since Dec. 17, 1945.

KEE-POFF—In capital letters within a box to represent a signboard. For insecticide repellent. Filed Feb. 23, 1946, by R. M. Hollingshead Corp., Camden, N. J. Claims use since Jan. 16, 1945.

NUOCIDE — This in capital letters, for toxicants for use in fungicides, insecticides, bactericides, compositions for agricultural pest control, mildew-proofing compositions, rot-proofing compositions, and marine antifouling compositions. Filed March 20, 1945 by Nuodex Products Co., Elizabeth, N. J. Claims use since Nov., 1944.

PORMAC—This in capital letters enclosed in a box, for poultry louse killing ointment. Filed June 27, 1945 by the Pormac Co., Bowling Green, Ky. Claims use since Jan. 1, 1944.

ENTOLETER—This in capital letters, underlined. For material treating machines for destroying insect life by mechanical action by impacting or otherwise engaging particles of the insect life in a flowing stream of the material, material treating machines for disintegrating a bulk material by mechanical action with or without an insect-life destroying action, and material treating machines in which the material passes through a treatment zone with the aid of centrifugal action with a combined insect-destroying and separating or mixing action. Filed Nov. 23, 1944 by the Safety Car Heating and Lighting Co., Inc., New York. Claims use since March 26, 1940.

COCCI-DINE — This in heavy capital letters. For astringent and acidulant for use in the treatment of coccidiosis in poultry. Filed Sept. 26, 1945, by N. N. Durham, doing business as Durham's Prescription Pharmacy and Durham's Rx Pharmacy, Comanche, Tex. Claims use since Jan. 1, 1936.

ORTHO SCIENTIFIC PEST CONTROL — The word "Ortho" in bold capital letters, with the remainder in small white letters beneath. For parasiticides—namely, insecticides and fungicides; spray adjuvants, herbicides, and compounds which influence specific physiological processes in plants. Filed Nov. 6, 1945, by California Spray-Chemical Corp., Wilmington, Del., and Richmond, Calif. Claims use since March 10, 1907, on the word "Ortho," and since Sept. 11, 1945, on the mark presented.

DOX — This in large, bold capital letters. For parasiticides, namely, insecticides, herbicides, fungicides, and spray adjuvants. Filed Jan. 30, 1946 by California Spray-Chemical Corp., Wilmington, Del., and Richmond, Calif. Claims use since Dec. 31, 1945.

L-P-C—This in open capital letters. For insecticides. Filed Nov. 9, 1945, by Laboratory Products Corp., New York. Claims use since Oct. 29, 1945.

RHOTHANE — This in capital letters, for insecticides, fungicides, and disinfectants. Filed Nov. 13, 1945, by Rohm & Haas Co., Philadelphia. Claims use since September 25, 1945.

Trade Marks Granted

421,302. NUTRITITIONAL SCOURS CONTROL REMEDY FOR LIVE STOCK AND PARTICULARLY YOUNG CALVES. Blatchford Calf Meal Co., Waukegan, Ill. Filed Jan. 12, 1945.

421,359. INSECTICIDES. Lee Nusbaum, doing business as Pennsylvania Engineering Co., Philadelphia, Pa. Filed Oct. 2, 1945.

421,360. ANTIBACTERIAL PREPARATION FOR VETERINARY USE. Sharp & Dohme, Inc., Philadelphia, Pa. Filed October 2, 1945.

421,371. INSECTICIDES. The Chemical Service Co., Baltimore, Md. Filed Oct. 11, 1945.

421,376. INSECTICIDES FOR USE IN KILLING FLIES, BEDBUGS, INSECTS AND THE LIKE. George W. Hudson, doing business as Crafton Chemical Co., Richmond, Va. Filed Oct. 22, 1945.

The Listening Post

By G. J. Haeussler

This column is prepared especially for readers of AGRICULTURAL CHEMICALS. Mr. Haeussler is in charge of Insect Pest Survey and Information, Agricultural Research Administration, Bureau of Entomology and Plant Quarantine, U.S.D.A. His observations, based on latest reports from Bureau field representatives all over the country, will be a monthly feature of AGRICULTURAL CHEMICALS.

CONDITIONS during the month of June have been generally favorable for insect development. A quick review of the status at the end of the month of some of the more important pests requiring chemicals for their control may help to give a general picture of conditions.

The boll weevil situation is serious and there is danger of heavy damage. The overwintered weevils were more numerous in cotton fields in early June than they have been at that same time in many years. They are abundant in all the Atlantic and Gulf Coast States from North Carolina to Texas. In Texas, the weevils have stripped the plants of most squares as fast as they were formed on early planted cotton and younger cotton planted during late May and early June is due for attack.

By the middle of June, the cotton flea hopper had caused more actual damage to cotton than any other insect. Most of the infestations have developed in southern and eastern Texas, although some damage was reported from the Piedmont area of South Carolina and the Mississippi Delta. Probably more growers than ever before have applied chemicals to protect their cotton from these insects. Many have dusted with sulfur; others, especially where the boll weevil occurs, have used mixtures of sulfur and calcium arsenate; and for the first time large acreages have been dusted with DDT insecticides. Many farmers have attempted to retard the flea hopper in the hope of setting a cotton crop before the weevils become more numerous.

The first authentic cotton leafworm specimen in this country this season was taken on June 7 near San Benito, Texas. The first leafworms usually appear in Texas during April or May. Additional infestations were later reported as building up in Jim Wells and Willacy Counties. The worms may become abundant enough to demand attention from cotton growers during July, August, and September if conditions are favorable.

COOL weather during May in most apple growing regions was rather unfavorable for development of the codling moth, the number one apple pest. Activity increased with more suitable weather conditions during June. Emergence of the spring-brood moths was about complete in most areas before the end of the month and adults of the first brood were about ready to start emerging in Kentucky and southern Illinois. Injury due to attack of first-brood worms was not reported as unusually severe from any areas.

The plum curculio caused considerable injury to peach, plum, cherry and apple in New York. In the Fort Valley area of Georgia, Elberta peaches were severely attacked by curculio, although earlier ripening varieties escaped injury by worms of the second generation. Considerable injury to peach also occurred during the latter half of June in western Kentucky, southern Indiana, southern Illinois, and in Mississippi.

Cabbage caterpillars occurred during June in moderate to heavy populations on cabbage and related crops in the Atlantic and Gulf Coast States from South Carolina to Louisiana and in northwestern Tennessee. They were reported as present in light to moderate numbers in New York, New Jersey, Maryland, Virginia, Mississippi, Ohio, Minnesota, Utah, and California.

Early in June the Colorado potato beetle was abundant on potato, tomato, or both crops in New York, New Jersey, Pennsylvania, Virginia, Florida, Tennessee, and central Washington. Populations generally decreased or the insect was brought under control in most areas as the month advanced. Infestations continued abundant in central Washington and were reported as abundant on potatoes in Maine toward the end of the month.

Flea beetles were abundant after the middle of June on potatoes in Maine, New York, North Dakota, and Minnesota, though damage has not been serious. A severe outbreak of climbing cutworms on peanuts appeared to be building up in southwestern Georgia late in June.

The tomato fruitworm was causing light to moderate injury to tomatoes in most of the Southern States during the last half of June. Heavy infestations of the Mexican bean beetle have occurred along the Atlantic and Gulf Coast States from North Carolina to Alabama and also in parts of New York, New Jersey and Tennessee. This insect has been present in light to moderate numbers in Maine, Delaware, Maryland, Virginia, Mississippi, Ohio, Nebraska, Wyoming and Utah. The bean leaf beetle was reported numerous early in June in Delaware, Alabama, and Louisiana, and moderately abundant later in northwestern Tennessee. Infestations of the potato leafhopper were generally light to moderate during June on potatoes and beans.

Aphids were troublesome on fruit in some areas, but not unusually serious. The apple aphid was reported as causing injury in Georgia and Washington early in June and as increasing in abundance later in the month in southern Illinois and southern Indiana. Infestations of the rosy apple aphid were disappearing from most areas toward the end of the

month. The mealy plum aphid caused some trouble in the Yakima Valley of Washington. An outbreak of the walnut aphid developed in Tulare and Fresno Counties of California, and serious infestations of aphids occurred on plums in the Fresno district.

Moderate to heavy infestations of the pea aphid occurred during June in many areas. The most serious infestations, with crop losses already occurred or in prospect were reported from northern and north central Illinois, southern Wisconsin, the Blue Mountain district of eastern Washington and Oregon and from southern Minnesota. Moderate populations were reported from northern Utah and south central Idaho. The pea aphid population in New Jersey continued at such low levels that insecticide treatments were not required after the middle of May.

The cabbage aphid has caused moderate to heavy damage to cole crops in Alabama, southern California, and central Washington. Light infestations were reported from Tennessee and Mississippi. The potato aphid was present on potatoes and tomatoes in New York, Maryland, Virginia, Mississippi, Ohio, and Washington. Various aphids were reported on potatoes in Maine during the last half of June.

Continued dry weather and high temperatures favored grasshopper development in many areas during the first half of June, including Arizona, California, southwestern Oklahoma, south central South Dakota, east central Texas, north central Montana, and eastern Wyoming. Bait mixing stations have been active and considerable amounts of bait have been spread by farmers in many areas.

Reports for the first half of June indicated that very few chinch bugs had been observed in any sections of Missouri and that they occurred in damaging numbers in northeastern Oklahoma in only a few barley fields. Casual observations indicated little likelihood of a serious chinch bug outbreak in Illinois.

2,4-D VS NEW YORK WEEDS

(*Continued from Page 49*)

into much smaller diameters, the smallest of which are about ¼ micron in size. These tiny particles form the fog which characterizes the work of the machine.

The fog machine is suitable for covering large areas with 2, 4-D, but other type of applicators are necessary for smaller plots where the chemical should not be allowed to fall on adjacent properties, it was pointed out. The knapsack sprayer is ideal for treating corners of lots, and power sprayers are suitable for operation where conditions do not favor use of other equipment.

The city is compiling facts and figures on the use of 2, 4-D, but the data is not yet available for publication. Close records of potencies, costs, and time involved in chemical weed killing have been kept in a number of experiments, so that a complete collection of factors entering into the picture should be forthcoming later.

Industry Patents

The following patents have recently been issued by the U. S. Patent Office on products and devices in the agricultural chemical field.

No. 2,400,295. INSECTICIDES. Patent granted May 14 to Karl Folkers, Plainfield, Edward Rogers, Cranford, and Ralph E. Heal, New Brunswick, N. J., assignors to Merck & Co., Inc., Rahway, N. J. An insecticide and insect-repellent, comprising alkaloids of plants of the genus Ryania and a carrier therefor.

* * *

No. 2,400,674. FUMIGATOR. Patent granted May 21, 1946 to Charles Williams, Antioch, Nebr. A device for mounting on the honey section of a bee hive, trough supporting strips extended across the frame in spaced relation, troughs extended between the said supporting strips and attached thereto at their upturned margins, said margins however being spread from the strips at spaced points for providing louvers opening downwardly into the honey section, and through which louvers chemical fumes may descend into the honey section from any solution held in the troughs.

* * *

No. 2,400,702. METHOD AND APPARATUS FOR DUSTING PLANTS. Patent granted May 21, 1946, to George S. Messinger and Clyde Messinger, Tatamy, Pa., assignors to Messinger Mfg. Co., Tatamy, Pa. A dusting apparatus comprising a plurality of laterally spaced nozzles, means for forcing a stream of dust laden air moving at high velocity into each of said nozzles each nozzle being adapted to receive such current and to form therefrom a current of dust laden air which rotates about an axis and progresses longitudinally of said axis, said nozzles being constructed and arranged so that the axes of their respective discharging currents are substantially parallel, and each such current rotates immediately adjacent and in a direction opposed to that of the immediately adjacent rotating current or currents.

No. 2,400,703. DISTRIBUTOR FOR DUST APPLYING MECHANISMS. Patent granted May 21, 1946, to George S. Messinger, Tatamy, Pa., assignor to Messinger Mfg. Co., Tatamy, Pa. A distributor for dust-laden gases comprising a casing having a relatively large inlet port and a circular series of relatively small outlet ports, a generally tubular directing member mounted for rotation about a fixed axis, the inlet end of said member being in constant register with the inlet port and the outlet end being eccentric to said axis and disposed to register successively with said outlet ports as said member rotates in one direction, the trailing side of said member being cut away adjacent the outer end thereof, and substantially parallel guards projecting rearwardly from said member for momentarily confining dust-laden gas escaping through the open side of such member.

DDT IN LIVESTOCK SPRAY

(*From Page* 31)

nasal discharges prevented direct contact of the insecticide with the fly.

Fleas

The stick-tight flea of poultry (*Echidnophaga gallinacea* (Westw.)) has been satisfactorily controlled by DDT, as well as other fleas inhabiting chicken houses.[16, 17, 20, 35, 64]

LITERATURE CITED

(1) Annand, P. N. 1943. Report of the Chief of the Bur. of Ent. and Pl. Quar.

(2) Annand, P. N. 1944. Report of the Chief of the Bur. of Ent. and Pl. Quar.

(3) Annand, P. N. 1945. Report of the Chief of the Bur. of Ent. and Pl. Quar, 1945.

(4) Anon. 1945. Experiments with DDT conducted by State Agricultural Experiment Stations, Agricultural Colleges and other non-Federal research organizations. Bur. of Ent. and Pl. Quar. E. 644 K. 2 pages [Oklahoma].

(5) Anon. 1945. Cattle sprayed with DDT fatten faster. Vet. Med. 40(12): 401.

(6) Anon. 1945. DDT as a blowfly repellent. Vet. Rec. 57(17): 198.

(7) Anon. 1945. Power spraying routs hog lice. Washington Farmer, (70) (11): 310.

(8) Anon. 1946. The use of DDT and "666" as insecticides against grain pests I and II. Jour. Sci. and Indus. Res. 4(2): 73-79, [Reviewed in Exp. Sta. Rec. 94(4): 501 April 1946].

(9) Babcock, O. G. 1944. DDT for the control of goat lice. Jour. Econ. Ent., 37(1): 138.

(10) Blakeslee, E. B. 1944. DDT as a barn spray in stablefly control. Jour. Econ. Ent.,, 37(1): 134-135.

(11) Blaxter, K. L. 1945. Control of flies in cowsheds. Experiments with DDT. Agriculture (London), 52(3): 112-115.

(12) Burtt, E. T. 1945. The mode of action of sheep dips. Ann. Appl. Biol., 32(3): 247-260.

(13) Buxton, P. A. 1945. The use of the new insecticide, DDT in relation to the problems of tropical medicine. Trans. Roy. Soc. Trop. Med. & Hyg., 38(5): 367-400.

(14) Cobbett, N. G., and C. E. Smith. 1945. DDT has possibility of becoming a remedy for sheep ticks. Jour. Am. Vet. Med. Ass'n., 107(822): 147-148.

(15) Cragg, J. B. 1945. DDT as a sheep blowfly dip. Nature, 155 (3935): 394. [Reviewed in Exp. Sta. Rec. 93(4): 471. 1945].

(16) Davis, D. E. 1945. The control of rat fleas (*Xenopsylla cheopis*) by DDT. U. S. Pub. Health Reports, 60 (18): 485-489.

(17) Dove, W. E. 1945. Summary of DDT experiments on insects that affect man and animals. Bur. of Ent. and Pl. Quar. E-673, 14 pages.

(18) Eleazer, J. M. 1946. Clemson echoes. National County Agent, 2(3): 42.

(19) Elmes, B. G. T. 1945. DDT treatment of mange (scabies) in rabbits. Lancet 18: 563. [Reviewed in North Amer. Vet., 26(12): 725, 1945].

(20) Fenton, F. A., C. H. Brett, F. E. Whitehead, G. A. Bieberdorf, and R. R. Walton. 1945. DDT: A new insecticide. Okl. Agri. Exp. Sta. Mimeo. Circ. M-147: 8 pages.

(21) Freeborn, S. B. 1945. Use against household insects or insects of medical importance. Investigations with DDT in California, 1944. Univ. of Cal. Div. of Ent. and Parasit. Pages 3-4.

(22) Gjullin, C. M., and Don C. Mote. 1945. Notes on the biology and control of *Chrysops discalis* Williston (Diptera-Tabanidae). Proc. Ent. Soc. Wash., 47(8): 236-244.

(23) Gouck, Harry K., and Carroll N. Smith. 1944. DDT in the control of ticks on dogs. Jour. Econ. Ent., 37(1): 130.

(24) Granovsky, A. A. 1945. Experiments with DDT by State Agricultural Experiment Stations, Agricultural Colleges and other non-Federal research organizations. Bur. of Ent. and Pl. Quar., E-644, 4 pages.

(25) Hagen, Cecil. 1946. Device

sprays 2500 sheep an hour. Washington Farmer, 71(11): 5.

(26) Harbour, H. E., and J. A. Watt. 1945. Spraying trials with DDT and "666" against the sheep blowfly. Vet. Rec. 57(52): 685-686.

(27) Heath, G. B. S. 1945. The use of DDT against sheep keds. Vet. Jour., 101(8): 180.

(28) Hellier, F. F. 1945. Scabies and DDT. Brit. Med. Jour., 2:255.

(29) Kanegis, L. A., and M. H. Roepke. 1946. DDT: A review with special reference to veterinary medicine. Jour. Amer. Vet. Med. Assn., 108(830): 316-321.

(30) Kemper, H. E., and I. H. Roberts. 1946. Preliminary tests with DDT for single- treatment eradication of the swine louse, *Haematopinus suis*. Jour. Amer. Vet. Med. Assn., 108(829): 252-254.

(31) Kulash, Walter M., and J. Myron Maxwell. 1945. DDT and bed-bugs in chicken houses. Jour. Econ. Ent., 38(5): 606.

(32 Laake, E. W. 1946. DDT for the control of hornfly in Kansas. Jour. Econ. Ent., 39(1): 65-68.

(33) Legg, J. 1945. Control of the buffalo fly with DDT spraying of animals. Austral. Vet. Jour., 21(3): 56.

(34) Lindquist, A. W., A. H. Madden, H. G. Wilson, and H. A. Jones. 1944. The effectiveness of DDT as a residual spray against houseflies. Jour. Econ. Ent., 37(1): 132-134.

(35) Lindquist, Arthur W., A. H. Madden, and E. F. Knipling. 1944. DDT as a treatment for fleas on dogs. Jour. Econ. Ent., 37(1): 138.

(36) Lyle, Clay. 1945. Uses of DDT on pests of farm home. Miss. Farm Research, 8(9): 1.

(37) Lyle, Clay, and R. G. Strong. 1945. Dusting for cattle lice. Jour. Econ. Ent., 38(5): 611-612.

(38) Matthysse, John G. 1945. Large scale power dusting of feeder lambs for winter control of the sheep tick. Jour. Econ. Ent., 38(3): 285-290.

(39) Matthysse, John G. 1945. Grub control on dairy cattle in the northeast. Jour. Econ. Ent., 38(4): 442-446.

(40) Matthysse, John G. 1946. DDT to control hornflies and Gulf Coast ticks on range cattle in Florida. Jour. Econ. Ent., 39(1): 62-65.

(41) Michelbacher, A. E., R. F. Smith, and G. L. Smith. 1945. Control of flies in a dairy barn with DDT. Investigations with DDT in California, 1944. Univ. of Calif. Div. of Ent. and Parasit., pages 8-9.

(42) Miller, A. W. 1945. Report of the Chief of the Bureau of Animal Industry, 1945, 50 pages.

(43) Moore, Earl N. 1946. Use of DDT to control sarcoptic mange. Jour. Amer. Vet. Med. Assn., 108(828): 162.

(44) Munro, J. A., and R. Knapp. 1945. Effect of DDT on cattle lice. N. D. Exp. Sta. Bimonthly Bull., 7(4): 21.

(45) Munro, J. A., K. Redman, and J. H. Longwell. 1945. Effectiveness of DDT against flies in livestock barns. N. D. Exp. Sta. Bimonthly Bull., 7(5): 21-23.

(46) Parish, H. E., and C. S. Rude. 1945. DDT for the control of goat lice. Jour. Econ. Ent., 38(5): 612-613.

(47) Parish, H. E., and C. S. Rude. 1946. DDT to control the winter horse tick. Jour. Econ. Ent., 39(1): 92-93.

(48) Parker, R. L. 1945. Experiments with DDT conducted by State Agricultural Experiment Stations, Agricultural Colleges, and other non-Federal Research Organizations. Bur. of Ent. and Pl. Quar. E-644 r, 2 pages.

(49) Peairs, L. M. 1946, DDT and hornfly population. Jour. Econ. Ent., 39(1): 91-92.

(50) Povar, M. L. 1946. Value of DDT for the control of the northern feather mite (*Liponyssus sylviarum*). Cornell Vet., 36(1): 91-92.

(51) Rude, C. S., and Charles L. Smith. 1944. DDT for the control of Gulf Coast and spinose ear tick. Jour. Econ. Ent., 37(1): 132.

(52) Rude, C. S., and H. E. Parish. 1946. Control of the sheep tick by a single dipping in DDT emulsion. Bur. of Ent. and Pl. Quar. E-679, 2 pages.

(53) Salces, Fermin, and Santos P. Calvo. 1945. Ensayo experimental con DDT sobre *Oestrus ovis*. Rev. Med. Vet. Buenos Aires An. 31, 27(3-4): 137-142.

(54) Schneider, R. 1943. Neocidal als Louse Bekampfungsmittel beim Pferd. Schweiz. Arch. f. Tierheilk, 85(5): 206-209.

(55) Shull, W. E., Glenn C. Holm, and H. C. Manis. 1945. Tick control on sheep. Univ. of Idaho Ext. Circ., 88, 4 pages.

(56) Shull, W. E., H. C. Manis, and Glenn C. Holm. 1945. Grubs and lice on cattle. Univ. of Idaho Ext. Circ. 155, 11 pages.

(57) Shull, W. E., Glenn C. Holm, W. M. Beeson, and H. C. Manis. 1945. Hog lice control. Univ. of Idaho Exp. Sta. Circ. 103, 7 pages.

(58) Smith, Carroll N., and Harry K. Gouck. 1945. DDT to control ticks on vegetation. Jour. Econ. Ent., 38(5): 533-555.

(59) Smith, C. E., and A. L. Dugos, T. P. Dutsch, and T. C. Barber. 1945. Tests with DDT conducted during 1944. Ann. Rep. La. Agri. Exp. Sta. 1943-44; 76-77.

(60) Smith, Roger C., and E. G. Kelly,. 1946. DDT—what it is and how to use it. Mimeo. Circ. Kansas Dept. of Entomology and Extension Service, 16 pages.

(61) Squibb, R. L. 1945. Studies on the control of the nuche fly and cattle tick. Jour. Animal Sci., 4(3): 291-296.

(62) Squibb, R. L. 1945. New method for control of cattle ticks in tropic regions. Coastal Cattleman, 11(8): 23-24.

(63) Stage, H. H. 1945. Use of DDT in control of flies on cattle and around farm buildings. Bur. Ent. and Pl. Quar. E-675, 6 pages.

(64) Stage, H. H. 1946. The use of DDT in controlling fleas. Bur. of Ent. and Pl. Quar. E-680, 4 pages.

(65) Stewart, M. A. 1944. Rotenone and ox warble control. Jour. Econ. Ent., 37(6): 756-760.

(66) Strickland, F. L. 1946. Personal communication.

(67) Telford, H. S. 1944. Chicken lice control. Soap and Sanitary Chemicals, 20(8): 113,139.

(68) Telford, H. S. 1945. New insecticides for chicken lice control. Jour. Econ. Ent., 38(5): 573-576.

(69) Telford, H. S. 1945. DDT as a chicken louse control. Jour. Econ. Ent., 38(6): 700-703.

(70) Telford, H. S., and P. D. Harwood. 1945. DDT fails to remove horsebots. Jour. Econ. Ent., 38(3): 399.

(71) Twinn, C. R. 1945. Use of DDT in connection with household insects and medical and veterinary entomology. Mimeo. Report of the Canadian Ministry of Agriculture.

(72) Van Leeuwen, E. R. 1944. Residual effect of DDT against houseflies. Jour. Econ. Ent., 37(1): 134.

(73) Warren, D. C. 1945. The value of DDT for the control of the common chicken louse. Poultry Science, 24(5): 473-476.

(74) Wells, R. W. 1944. DDT as a fly spray on range cattle. Jour. Econ. Ent., 37(1): 136-137.

(75) Wiesmann, R. 1943. Eine Neue Methode der Bekampfung der Fliegenplagen in Stallen. Any. fur Schadlingskunde, 19(1): 5-8. [English translation, Soap and Sanitary Chemicals 19(12): 117, 119, 141, 143 (1943)].

(76) Wolfenbarger, D. O., and E. Hoffman. 1944. New uses for DDT. Poultry Science, 23: 545-546.

DDT DEMONSTRATION

(*From Page* 47)

Tree Commissions, Mosquito Commissions, Park Commissions, and representatives of the United States Department of Agriculture. Shade Tree Commission representatives at the demonstration included Edward Simpson, Arthur Felsenheld, Harry E. Turner, Howard Voorhees, A. P. Tansey, and James Walker. Mosquito Control Commission witnesses included O. C. Stivers and Donald Hudson; and the U. S. Department of Agriculture was represented by E. G. Brewer, George J. Baetzhold, and L. R. Fate. Park Commission representatives present included Carl Whitte, F. W. Loede, Jr., Edward Kelley and R. D. Crater. Dr. O. N. Linning, pathologist of East Orange was also at the demonstration as were of course officials of the Accurate Tool Company, sponsors of the event.

William F. Osborne, Secretary

of the company, indicated that further demonstrations will be made in the area using not only DDT but Pyrethrum insecticides as well. In prospect also is a weed killing experiment in which 2, 4-D will be sprayed on grassy spots to eliminate unwanted plants.

EXPERIMENT STATION DIGEST

(*From Page* 38)

nation of the weeds, says the Main report, "may lead to sufficient increase in yield of grain to more than cover the cost of the chemicals."

At the Amherst, Mass., experiment station tests were conducted with certain oil sprays on fields of carrots and parsnips, to destroy weeds without harm to the crops. Vegetable growers throughout the state also cooperated in field tests. Oils which in general pass the specifications for "Stoddard solvent" gave good weed control with no deleterious results, the report states. Among such approved materials were listed mineral spirits, "Naphtha No. 52." "Sovasol No. 5." Stoddard solvent, "Sun" spirits and "Varsol No. 2." Another oil, "Sovasol No. 75," proved to be a good selective weed killer when mixed with two parts of white kerosene.

All materials mentioned seemed to be highly selective for carrots, parsnips, celery and parsley, but leaves of celery and parsnips were more sensitive and under some conditions were severely burned by these oils, the report says. The sprays completely destroyed young beet and turnip plants. Oil applied when weeds were young and succulent gave best results, the weeds often wilting within a half hour if the day was clear and warm, and dying completely by another day. Most all common weeds were completely controlled except ragweed, which is particularly resistant to effects of the oil. There was no indication of a toxic residue in the soil when oils were applied at the rate of 80 to 120 gallons per acre, the dosage which effected good weed control. On the average, the material used to spray an acre cost about $20 and the report figures that at the then prevailing wage scale hand weeding of an acre of carrots would cost about $40. Details of the methods to be used have been published in Massachusetts State College Extension Special Circular 120.

PLANT HORMONES

(*From Page* 27)

treatment, it is obvious that their usefulness to the agricultural world is only at its beginning. Through the careful and continued study of these materials their applicability will be greatly extended to meet the needs of the plant grower. ★★

Bibliography

(29) Kadow, K. J. and Hopperstead, S. L.: Phytopathology 32:11, 1942.
(30) Avery, G. S., Jr.: U. S. Pats. 2,305,593, 1942; 2,318,733, 1943.
(31) Allen, T. C. and Fisher, E.: Canner 96:No. 22, 12, 1943.
(32) Jones, F. D.: U. S. Pats. 2,258,-291-2, 1941.
(33) Amlong, H. U.: Ger. Pat. 741,-783, 1943.
(34) Mecca, S. B.: U. S. Pat. 2,382,-326, 1945.
(35) Benson, W. L.: U. S. Pat. 2,395,446, 1946.

(36) Chalkley, L.: U. S. Pat. 2,328,193, 1943.
(37) Maxon, M. A., Pickett, B. S. and Rickey, H. W.: Iowa Agr. Expt. Sta., Research Bull. 280:931, 1940.
(38) Stoutemeyer, V. T.: Proc. Am. Soc. Hort. Sci. 44:529, 1944.
(39) Kordes, H.: Gartenbauwiss, 17:240, 1943.
(40) Batjer, L. P.: "Harvest Sprays for the Control of Fruit Drop," Circ. No. 685, Washington, U. S. Dept. Agric,. Sept. 1943.
(41) Gardner, F. E., Marth, P. C. and Batjer, L. P.: Proc. Am. Soc. Hort. Sci. 36:415, 1939.
(42) Hoffman, M. B., Van Doran, A. and Edgerton, L. J.: Proc. Am. Soc. Hort. Sci. 43:203, 1943.
(43) Ruth, W. A.: Trans. Illinois State Hort. Soc. 76:231, 1942.
(44) Hesse, C. O. and Davey, A. E.: Proc. Am. Soc. Hort. Sci. 40:55, 1942.
(45) Gustafson, F. G.: Proc. Nat. Acad. Sci. 22:628, 1936.
(46) Hitchcock, A. E. and Zimmerman, P. W.: Proc. Am. Soc. Hort. Sci. 42:141, 1943.
(47) Hitchcock, A. E. and Zimmerman, P. W.: U. S. Pat. 2,363,325, 1944.
(48) Marth, P. C.: Botan, Gaz. 104:26, 1942; Proc. Am. Soc. Hort. Sci. 42:620, 1943.
(49) Sell, H. M., Taylor, H. A. and Potter, G. F.: Botan. Gaz. 106:215, 1944.
(50) Veldstra, H.: Chem. Weekblad. 40:158, 1943.
(51) Sapp, W. S.: Proc. Penn. Acad. Sci.: 17:117, 1943.
(52) Zika, M.: Z. Zuckerind. 64:237, 1941.
(53) Amlong, H. U. and Naundorf, G.: Forschungsdienst 11:549, 1941.
(54) Bouillene-Walrand, M.: Bull. soc. roy. Liege 12:161, 1943.
(55) Crosier, W., Patrick, S. and Weimer, D.: Proc. Assoc. Offic. Seed Analysts North Am. 32:83, 1940.
(56) Stehlik, V. and Pazler, J.: Z. Zuckerind. 65:255, 1942 (through) Chem. Abstr. 38:2996, 1944.
(57) Stout, M. and Tolman, B.: J. Am. Soc. Agron. 36:141, 1944.
(58) Hardenburg, E. V.: Proc. Am. Soc. Hort. Sci. 45:367, 1944.
(59) Slade, R. E., Templeman, W. G. and Sexton, W. A.: Nature 155:497, 1945.
(60) Nutman, P. S., Thornton, H. G. and Quastel, J. H.: Nature 155:498, 1945.
(61) Blackman, G. E.: Nature 155: 500, 1945.

FOREIGN STUDIES ON DDT

(*From Page* 23)

(5) —— New synthetic insecticide. Chem. Trade Jour. and Chem. Engin. 114 (2964): 265. Mar. 10.
(6) —— Synthetic insecticides. Chem. Trade Jour. and Chem. Engin. 114(2966): 302. Mar. 24.
(7) —— More makers of DDT. Chem. Trade Jour. and Chem. Engin. 114(2968): 373. Apr. 7.
(8) —— The discovery of "DDT." Chem. Trade Jour. and Chem. Engin. 114(2973): 509. May 12.
(9) —— White magic. Arthur D. Little, Inc., Indus. Bul. 200: 1-2, May. Reprinted under title "Synthetic insecticides" in Chem. Trade Jour. and Chem. Engin. 115(2981): 21, July 7.
(10) —— Se descubre un nuevo producto equimico que destruye la mosca y la plaga de la cosechas. Rev. Nac. de Agr. (Bogotá) 38 (479): 45. May.
(11) —— Defeat of epidemic typhus. Lancet (London) 2(4): 115-116. July 22.
(12) —— Budworm. Timber of Canada 4 (11): 49-50. July.
(13) —— DDT. Fruit Grower, Fruiterer, Florist and Market Gard. 98 (2538): 83. Aug. 3.
(14) —— British work on DDT. Chem. Trade Jour. and Chem. Engin. 115 (2985): 111-112. Aug. 4.
(15) —— Post-war prospects. Chem. Trade Jour. and Chem. Engin. 115(2985): 112. Aug. 4.
(16) ANONYMOUS. The American chemical scene. DDT in agriculture. Chem. Trade Jour. and Chem. Engin. 115(2985): 125. Aug. 4.
(17) —— A multi-purpose insecticide. Med. Off. 72(7): 54-55. Aug. 12.
(18) —— D.D.T.: A new synthetic insecticide. Brit. Med. Jour. 2(4362): 217-218. Aug. 12.
(19) —— D.D.T. in agriculture. Farmer and Stock-Breeder 58(2863: 1322. Aug. 22.
(20) —— The DDT patent. Chem. Trade Jour. and Chem. Engin. 115 (2988): 209. Aug. 25.
(21) —— Hygienic plastics. Plastics 8(87): 352-353. Aug.
(22) —— Lice repellents. Mfg. Chem. and Pharm. and Fine Chem. Trade Jour. 15(8): 294. Aug.
(23) —— More U. S. makers of DDT. Chem. Trade Jour. and Chem. Engin. 115(2989): 232. Sept. 1.
(24) —— DDT—The new British insecticide. Chem. and Drug., Export Rev. 5(53): 4-5. Sept. 30.
(25) —— Insecticides research — The lessons of DDT. Chem. Trade Jour. and Chem. Engin. 115(2992): 302. Sept. 22.
(26) —— DDT Trials. Chem. Trade Jour. and Chem. Engin. 115(2993): 332. Sept. 29.
(27) —— Mr. Churchill on DDT. Chem. Trade Jour. and Chem. Engin. 115 (2994): 347-348. Oct. 6.
(28) —— DDT supplies. Chem. Trade Jour. and Chem. Engin. 115 (2994): 352-353. Oct. 6.
(29) —— Still more DDT makers. Chem. Trade Jour. and Chem. Engin. 115(2995): 393. Oct. 13.
(30) —— More about DDT. Fruit Grower, Fruiterer, Florist and Market Gard. 98 (2548): 273. Oct. 12.
(31) —— D.D.T. The new spray; what it can do. Smallhold., Poultry-Keeper and Gard. 72(1804): 11. Oct. 13.
(32) —— Insecticidal paints. Chem. Trade Jour. and Chem. Engin. 115 (2997): 432. Oct. 27.
(33) —— DDT for Salford. Chem. Trade Jour. and Chem. Engin. 115 (2997): 438. Oct. 27.
(34) ANONYMOUS. Supplies of DDT. Mfg. Chem. 15(10): 368. Oct.
(35) —— No D.D.T. just yet. Smallhold., Poultry-Keeper and Gard. 72(1807): 9. Nov. 3.
(36) —— Pharmacology of D.D.T. Chem. Trade Jour. and Chem. Engin. 115 (2998): 458. Nov. 3.
(37) —— Pharmacology of D.D.T. Chem. Trade Jour. and Chem. Engin. 115(2999): 486. Nov. 10.
(38) —— D.D.T. freed from price control. Chem. Trade Jour. and Chem. Engin. 115(2999): 506. Nov. 10.
(39) —— DDT insecticide. Chem. Trade Jour. and Chem. Engin. 115 (3001): 560. Nov. 24.
(40) ABRAHAMSON, G. DDT is being used in air raid shelters. Chem. and Engin. News 22(22): 2030. Nov. 25.
(41) —— Insecticidal paints incorporated with DDT. Chem. and Engin. News 22(24): 2234-2235. Dec. 25.
(42) ANANDA, RAU S. DDT—A new insecticide. Planters' Chron. 39: 940-942. Nov. 15. (Bibl. Agr. 6(4): 16680. April 1945.)
(43) —— ANNAND, P. N., and staff. Tests conducted by the Bureau of Entomology and Plant Quarantine to Appraise the usefulness of DDT as an insecticide. Jour. Econ. Ent. 37(1): 125-159. Feb.
(44) BLAUVELT, W. E. DDT and the florist. Canad. Florist 39: 202. July 20.
(45) BRAND, K., and BUSSE-SUNDERMANN, A. Über das 1,1,4,4-Tetrakis-(2,4-xylyl)-butatrien-(1,2,3) und die Bildung von 1, 1-Diaryl-2,2-dichlor-äthenen aus 1,1-Diaryl-2,2,2-trichlor-äthanen. XIV. Mitteilungen über die Reduktion organischer Halogenverbindungen und über Verbindungen der Tetraarylbutanreihe. Deut. Chem. Gesell. Ber. 75B: 1819-1829. 1942.
(46) BRECKENRIDGE, J. G. The preparation of "DDT." New insecticide finds war and peacetime uses. Canad. Chem. and Process Indus. 28: 570. Aug.
(47) BURNET, F. M. Promising new insecticides: inhibit developments of red scale crawlers; military use in combating typhus epidemic. Citrus News 20(5): 74. May 31.
(48) CAMERON, T. W. M. Fly sprays and repellents. Part II. DDT. Canad. Jour. Compar. Med. 8: 254-258. Sept.
(49) CAMPBELL, G. A. and WEST, T. F. DDT synthetic insecticide; its properties and potentialities. Chem. Trade Jour. and Chem. Engin. 115 (2988): 195-196. Aug. 25.
(50) —— DDT: The new synthetic insecticide. Chem. and Drug. 142 (3368): 225. Aug. 26.
(51) —— Notes on DDT. Chem. and Indus. 36: 319. Sept. 2.
(52) —— DDT, its preparation and potentialities. Chem. Age (London) 51(1315): 245-247. Sept. 9.

(53) —— DDT a new weapon in the war against the insect enemies of mankind. Mfg. Chem. (London) 15: 312-317. Sept.

(54) —— Persistence of D.D.T. in oil-bound water-paint. Nature (London) 154(3912): 512. Oct. 21.

(55) —— Observations on DDT, potent, important and versatile insecticide. Soap, Perfumery & Cosmetics 17: 744-745, 762. Oct.

(56) —— DDT, the new insecticide; a general survey and some possible paint applications. Oil & Colour Chem. Assoc. Jour. 27: 241-262. Dec.

(57) —— DDT and paint. Oil and Colour Trades Jour. 106(23): 855-856. Dec. 8.

(58) CHAMBERS, V. H., and HEY, G. L. An experiment with DDT for the control of apple blossom weevil. Fruit 5(9): 218-220. June.

(59) ——, HEY, G. L., and SMITT, N. K. D.D.T.—a review. Fruit Grower, Fruiterer, Florist & Market Gard. 98: 178-179, 218, 221-222. Sept. 7, 21.

(60) —— DDT, the new insecticide, with notes on preliminary experiments on the control of various insect pests. Market Grower (Reprint, 7 pp.). n.d.

(61) CHARLES, W. K. DDT . . . it makes bugs "jitterbug"! Furrow 49: 4, 12. Oct.-Nov.

(62) CHILE, MINISTERIO DE AGRICULTURA. DEPARTAMENTO DE SANIDAD VEGETAL. El uso del DDT en el combate de las plagas agricolas. El. Agrario 9(350): 30. Nov. 30.

(63) COLORADO, I. R., and LEYVA, R. E. Nota sobre la preparacion del 2,2(bis)p-clorofenil-1,1,1-tricloroetano (D.D.T.). Mex. Inst. de Salubridad y Enferm. Trop. Rev. 5: 71-74. June.

(64) CRAIK, G. DDT—scientific suspect, wonder insecticide begins to show shortcomings. Financ. Post 38 (35): 1. Aug. 26.

(65) DAVIAULT, L. La lutte contre la tordeuse [**Archips fumiferana**]. Foret Quebecoise 8: 277. Nov.

(66) DEAN, R. W. DDT in Sao Paulo. No. 535. Amer. Consulate Gen. Sao Paulo, Brazil. [Processed.] Dec. 15.

(67) DENMARK, STATENS FORSGSVIRKSOMHED I PLANTEKULTUR. Fors med gesarol-pudder mod skadedyr [Experiment with gesarol powder against pests.] Dansk Fravl. 27: 160-162. June 15.

(68) EMSLIE, B. L. Remarkable repellent. Sensational insecticide discovered. Saskatschewan Farmer 35(11): 11. June 1.

(69) —— DDT insecticide. Holstein-Friesian Jour. 7(3): 18, 19, June.

(70) —— DDT insecticide is sensational. Canad. Cattleman. 7(1): 39. June.

(71) —— The new DDT insecticide. Farmer Mag. 41(6): 68-69. June.

(72) —— DDT. Macdonald Col. Jour. 4(11): 9. July.

(73) FISCHER, O. Einwirkung von Chloral und Aldehyd auf Toluol. Deut. Chem. Gesell. Ber. 7: 1191-1197. 1874.

(74) FISK, N. R., and FISK, E. DDT—the new insecticide—a general survey and some possible paint applications. Paint Technol. Dec. 1944; Ref. in Soap and Sanit. Chem. 21(4); 155. April 1945.

(75) FLECK, E. E., and HALLER, H. L. Catalytic Removal of hydrogen Chloride from some substituted alphatrichloroethanes. Amer. Chem. Soc. Jour. 66(12): 2095. December.

(76) FREY, W. "Gesarol-Staub," ein neues chemisches Mittel gegen den Rapsglanzkäfer. Mitt. f. die Landw. 59: 235-236. Mar. 11.

(77) FROELICHER, V. The story of DDT. Soap and Sanit. Chem. 20(7): 115, 117, 119, 145. July.

(78) GEIGY A-G., J. R. Manufacture of aqueous emulsions for insecticidal purposes. British Patent 547,-871, Sept. 15, 1942.

(79) —— Manufacture of insecticidal compositions and the resulting products. British Patent 547,874, Sept. 15, 1942. [Abstracts in Chem. Abs. 37: 6400; Soc. Dyers and Colourists Jour. 59(2): 33. 1943.]

(80) —— Now it can be told. The true story of DDT which alleviated the typhus epidemic in Italy; amazing preventive possibilities in other fields; tremendous benefits to agriculture; scientists do 8 years research in 2; End of possibilities not in sight. Pests 12(7): 6, 8. July. Also in Drug, Vitamin, and Allied Indus. 30(8): 11-13. Aug.

(81) GORGAS MEMORIAL LABORATORY. 17th Annual Report 79th Congress, 1st Session, House Doc. 15, 32 pp. Jan. 3.

(82) GÖTZ, B. Neue Bekämpfungsmittel gegen den Himbeerkäfer. Deut. Obstbau 58(9): 156-158. Sept. 1943.

(83) GUTIERREZ, M. R. DDT Dichloro - diphenyl - trichloroethane. Dichlorodifenil - trichloroetano. Agronomia [Habana] 4: 321-322. June.

(84) HALLER, H. L., BARTLETT, P. D., DRAKE, N. L. and coworkers. The chemical composition of technical DDT. Jour. Organ. Chem. 67(9): 1591-1602. Sept. 1945.

(85) HAYWARD, K. J. Las "moscas blancas" (Aleyrodidae) y su control. Tucuman Estac. Expt. Agr. Cir. 128, 8 pp.

(86) HEILBRON, I. M. The new insecticidal material DDT. Roy. Soc. Arts. Jour. 93: 65-69. Jan. 5, 1945. (Bibl. Agr. 6(3): 11908. March 1945.)

(87) HEPBURN, G. A. "D.D.T."—a new synthetic insecticide. Citrus Grower 128: 6. Sept. 28.

(88) HEY, G. L. A note on DDT. Gard. Chron. 116(3013):112. Sept. 23.

(89) —— The new insecticide DDT. Hort. Advertiser No. 3209, p. 8. Oct. 18.

(90) HOLST, B. "Gesarol" ein Wunder der Chemie. Mitt. f. die Landw. 59: 445. May 13.

(91) JARL, F. Orienterande försök med flugbekampningsmedlet "Gesarol M" [Orientation experiments with the fly control remedy "Gesarol M"] Lantmannen 28; 1119-1120, 1123. Dec. 9.

(92) KOTTE, W. Gesarol ein grosser Forschritt in der giftfreien Schädlingsbekampfung. Sudwestdtsch. Ztschr. f. Obst u. Gartenbau 1943: 52-53. July 1943. [Abstract in Chem. Zentbl. 114(II): 1662. 1943.]

(93) LAPAGE, G. Applications of D.D.T. Nature [London] 154: 600-601. Nov. 11.

(94) LÄUGER, P., MARTIN, H., and MÜLLER, P. Über Konstitution und toxische Wirkung von naturlichen und neuen synthetischen insektentotenden Stoffen. Helvetica Chim. Acta 27: 892-928.

(95) LENT, H., and OLIVEIRA, S. J. DE. Nota preliminar sobre a acao do DDT (dicloro-difenil-tricloroetana) em insetos transmissores da doenca de Chagas. Rev. Brasil de Biol. 4: 329-331. Sept.

(96) LEPAGE, H. S., and GIANNOTTI, O. D.D.T. (Dicloro-difenil-tricloroetana). Biologico 10: 239-252. Aug.

(97) —— Experiences com o D.D.T. Biologico 10: 353-366. Nov.

(98) LESLIE, A. B. The introduction and sale of DDT insecticide in Brazil. No. 746, Amer. Embassy, Rio de Janeiro, Brazil. 2 pp. [Processed.] Aug. 19.

(99) —— The sale of DDT insecticides in Brazil. No. 2023, Amer. Embassy, Rio de Janeiro, Brazil. 2 pp. [Processed.]

100) [ever], R.J.A.W. The new insecticide DDT. Fiji Dept. Agr., Agr. Jour. 15(3): 80 Sept.

(101) —— Entomological notes Fiji Dept. Agr., Agr., Jour. 15(3): 76-80, Sept.

(102) MANDEKOS, A. Toxische Wirkung von Neocid auf Larven, Puppen und Imagines von **Anopheles** und **Culex**. Deut. Tropenmed. Ztschr. 48: 84-88. Feb.-Mar.

(103) MARTIN, H., STRINGER, A., and WAIN, R. L. The qualitative examination of insecticidal properties. Progress report—1943. Bristol Univ., Agr. and Hort. Res. Sta. Ann. Apt. 1943: 62-76.

(104) MARTIN, H., and WAIN, R. L. Insecticidal action of D.D.T. Nature [London] 154(3912): 512-513. Oct. 21.

(105) —— DDT: Its properties and possible uses in horticultural pest control. Roy. Hort. Soc. Jour. 69: 366-369. Dec.

(106) MESSERLI, E. Kann Gesarol den Bienen schaden? Schweiz. Bienen Ztg. 66(4): 217-218. Apr. 1943.

(107) MOOSER, H. Die Bedeutung des Neocid Geigy für die Verhütung and Bekämpfung der durch Insekten ubertragenen Krankheiten. Schweiz. Med. Wchnschr. 74(36): 947-952. Sept. 1944.

(108) MORGAN, L. "It was D.D. T. that did it." Citrus Grower 131: 9-10. Dec. 22.

(109) MÜLLER, K. R. Grosser Fortschritt in der Fliegenvernichtung. Landesbauernschaft Sachsen-Anhalt. Wchnbl. 101: 553. Oct. 23, 1943.

(110) MÜLLER, P. Devitalizing composition of matter. To J. R. Geigy A.G., Basel, Switzerland, U. S. Patent 2,329,074; Sept. 7, 1943.

(111) MUNRO, J. W. D.D.T.: A new insecticide. Nature [London] 154 (3907): 352-353. Sept. 16.

(112) NORRIS, D. O. The evaluation of DDT as a fungicide. Austral. Council Sci. and Indus. Res. Jour. 17: 289-290. Nov.

(113) OLSEN, N. J. H. Bekaempelse af fluer [Control of flies.] Ugeskr. for Landmaand 89: 646-647. Oct. 27.

(114) PEEDE, L. G. EL DDT augura el triunfo contra los insectos. Hacienda 39(8): 362-363, 367. Aug.

(115) PROULX, J. R. Puissant insecticide. Bul. des Agr. 40(8): 24-25. Aug.

(116) REUTER'S LIMITED OF LONDON NEWS SERVICE. Cientificos Britanicos hacen un importante descubrimiento que salvara millones de vidas. La Prensa, Lima, Peru. Aug. 3.

(117) ROARK, R. C. Trade marked insecticides containing DDT. Soap and Sanit. Chem. 21(4): 137, 155, 157. April 1945.

(118) ——, and McINDOO, N. E. A digest of the literature on DDT through April 30, 1944. U. S. Bur. Ent. and Plant Quar. E-631, 53 pp. [Processed.] December.

(119) ROBINSON, G. G. Testing insecticides on the argasid tick, **Ornithodoruos moubata** Murray. Bul. Ent. Res. 35(2): 95-99. July.

(120) ROSENBERG, G. EL DDT en el control del "capacho" de la vid. Rev. Union Agr. del Sur 2(14): 1-2. Oct. 18. [Reprint.]

(121) —— "El efecto de algunos insecticidas en el establecimiento y desarrollo de las larvas migratorias de la conchuela roja de los citrus **Aonidiella aurantii** (Mask." Bol. Dept. San. Veg. Chile 3(2): 143-165.

(122) ROSS, W. A. Summary of experiments with DDT at Vineland Station, Ont., February to May, incl., 1944. Canada Dept. Agr. Ent. Branch, 15 pp. [Processed.]

(123)——Summary of DDT investigations (Second report). Dominion of Canada, Div. of Ent. Pub. No. 19. January 1945 [Processed.]

(124) —— DDT—a powerful new insecticide. Farmers Advocate and Home Mag. 79(3230): 313. May 11.

(125) —— A powerful new insecticide. Canad. Hort. and Home Mag., Grower's Ed. 67: 123-124. June.

(126) —— DDT, powerful insecticide, in experimental stage, may become pests' No. 1 enemy. Country Life in Brit. Columbia 28 (6, l.e. 7): 3. Aug.

(127) SCHMID, G. Versuche über Läusebekämpfung im Pferd. Schweiz. Arch. f. Wiss. u. Prakt. Tierheilk. 85(5): 206-209. May 1943.

(128) SCHNEIDER, R. Neocidol als Läusebekämpfungsmittel. Schweiz. Arch. f. Tierheilk. 85: 435-455. Nov. 1943.

(129) SEABROOK, W., and SONS, LTD. Apple blossom weevil — good news. Fruit 5(9): 216-217. June.

(130) SEALY-FISHER, C. W. The history of D.D.T. Something the war has done for farming. Farmer [Natal] 34(3): 8. January 19, 1945.

(131) SERGENT, E., and BÉGUET, M. Conclusions pratiques à tirer d'une experience d'epouillage par poudrage insecticide faite à Maison-Carée et l'Arba (Algérie). Inst. Pasteur d'Algérie, Arch. 22: 109-112. June.

(132) STANFORD, E. N. Post-war pest control. Canad. Business 17(9): 90-91, 160, 162, 164, 166. Sept.

(133) STELLWAAG, F. Eine einfache und wirksame Bekämpfung der Kleidermotten. Anz. f. Schädlingsk. 19: 70-72. 1943.

(134) SUTER, J. Antworten, Kann "Gesarol" den Bienen schaden? Schweiz. Bienen Ztg. 66(5): 249-250. May 1943.

(135) THOMANN, H. Ueber Erdraupenschäden im Sommer 1943 am Tabak und Mais im Bünder und

St. Galler Rheintal. Schweiz. Landw. z. die Grüne 71(45): 1176-1180. Nov. 5, 1943.

(136) —— Ueber Erdraupenschäden im Sommer 1943 am Tabak und Mais im Graubündner Rheintal. Schweiz. Ent. Gesell. Mitt. 19(4-5): 169-179, illus. [Abstract in Rev. Appl. Ent. 32A(10): 321. Oct.]

(137) TWINN, C. R. A note on DDT, the new synthetic insecticide. Canad. Ent. 76(4): 87-88 Apr.

(138) VAZ, Z., PEREIRA, R. S., MALHEIRO D. M. Calcium in prevention and treatment of experimental DDT poisoning. Science 101 (2626): 434-436. April 27, 1945.

(139) WASICKY, R., and UNTI, O. Dichloro-difenil-trichloroetano (DDT) no combate as larvae de culicideos. Arq. de Hig. e Saude Pub. 9(21): 87-102.

(140) WEST, T. F., and CAMPBELL, G. A. DDT. Indus. Chem. and Chem. Mfr. 20: 461-465. Sept.

(141) —— The behaviour of DDT in paints; a promising method of application. Indus. Chem. and Chem. Mfr. 20: 647-648. Dec.

(142)——The story of D.D.T. and its role in anti-pest measures. Chem. and Indus. No. 10: 75-76. March 10, 1945.

(143) WIESMANN, R. Neue Versuche mit Arsenersatztoffe im Obstbau. Schweiz. Ztschr. f. Obst u. Weinbau 51(7): 155-156. Mar. 28, 1942. [Abstracts in Chem. Abs. 37: 5822, 1943; Chem. Zentbl. 113(2): 825. 1942.]

(144) —— Vergleichende Versuche zur Bekämpfung des einbindigen Traubenwicklers, Clysia ambiguella, mit neuen Mitteln. Schweiz. Ztschr. f. Obst. u. Weinbau 51(9): 206-220. Apr. 25, 1942. [Abstracts im Chem. Abs. 37: 5821, 1943, and Chem. Zentbl. 113(2): 825. 1942.]

(145) —— Ueber neue, wirksame Arsenersatzstoffe im Obstbau und ihre Bedeutung für die Bienenzucht. Schweiz. Bienen-Ztg. 65(5): 227-229. May 1942.

(146) —— Weitere Versuche über Gesarol und Honigbienen. Schweiz. Ztschr. f. Obst. u. Weinbau. 51(11): 245-251. May 23, 1942.

(147) —— Eine neue Anwendungsmöglichkeit des Arsenersatzstoffes "Gesarol." Bekämpfung der Fliegenplage in Stallen. Schweiz. Ztschr. f. Obst. u. Weinbau 51(16): 329-330. Aug. 1, 1942.

(148) —— Eine neue Methode der Bekämpfung der Fliegenplagen in Stallen, Anz. f. Schädlingsk. 19(1): 5-8, Jan. 1943 [Abstract in Chem. Zentl. 114(1): 2720. 1943.] (A translation by Carlo Zeimet was mimeographed and distributed by the Bureau of Entomology and Plant Quarantine in Oct. 1943, and printed under the title "Fly Control in Stables" in Soap and Sanit. Chem. 19(12): 117, 119, 141, 143. Dec. 1943.)

(149) —— Eine neue wirksame Methode der Bekämpfung der Fliegenplagen in Stallen. Schweiz. Arch. f. Tierheilk 85(1): 24-36. Jan. 1943.

(150) —— Weitere Versuche mith Gesarol in Obstbau. Schweiz. Ztschr. f. Obst. u. Weinbau 52(6): 171-204. Mar. 13, 1943. [Abstract in Chem. Zentl. 114(II): 170. 1943.]

(151) —— Neue Untersuchungen uber die Bekämpfung der Kirschfliege **Rhagoletis cerasi**, L. Schweiz. Ztschr. f. Obst. u. Weinbau 52(6): 232-252. Mar. 13, 1943. [Abstract in Chem. Zentbl. 114(II) 170. 1943, and Chem. Abs. 38:6481. 1944.]

(152) —— Vergleichende Versuche zur Bekämpfung des Traubenwicklers mit den neuen Arsenersatzstoffen. Schweiz. Ztschr. f. Obst. u. Weinbau 52(5): 117-131. Feb. 27, 1943.

(153) ——, and FENJVES, R. Autotomie bei Lepidopteren und Dipteren nach Beruhrung mit Gesarol. Schweiz. Ent. Gesell. Mitt. 19(4-5): 179-184, illus. [Abstract in Rev. Appl. Ent. 32A(10): 321. Oct.]

(154) WILSON, J. L. Plea for DDT supplies to control pests. Farmer and Settler 38(46): 10. Dec. 15.

(155) ZATTLER, F. Schädlingsbekämpfung beim hopfen im sommer 1943. Deut. Brauwirtsch. 1943: 214-215. July 29, [Abstract in Chem. Zentbl. 114(II): 1399. Oct. 13, 1943.]

(156) ZEIDLER, O. Verbindungen von Chloral mit Brom- und Chlorbenzol. Deut. Chem. Gesell. Ber. 7: 1180-1181. 1874.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of Agricultural Chemicals, 254 W. 31st St., New York 1. Closing date: 1st of month.

Technical Sales Service: B. S. Cornell University—Summer Assistant in Plant Pathology and Entomology Maine Agricultural Experimental Station. Desire position with fungicide and insecticide firm. East coast preferred. Two years teaching experience Air Force Radar School. Box 111, care of *Agricultural Chemicals*.

Free Advts. for Veterans

As a service to veterans seeking jobs in the agricultural chemical field, this magazine will accept, without charge, classified advertising from World War II veterans seeking positions. Advertisements should reach us before the first of the month of publication, and should include all essential information, such as experience, skill, age, type of work sought and location desired. Address Agricultural Chemicals, 254 West 31st St., New York 1, N. Y.

CONSULTING ENTOMOLOGIST

Insecticides — Formulation
Plant Pathology — Research
Entomology — Legal Service

Eighteen Years consulting work. Thirty years technical agriculture.

DR. E. R. de ONG

926 Stannage Ave., Albany 6, Calif.

Purchasing: Young Lawyer, Eight years assistant purchasing chemicals, medicals, equipment large company, desires position purchasing or other department where experience and legal training will be of value. Knowledge contracts, legislation, labeling, purchasing routine. Age 30, Fordham graduate. For further details, address Box 110, care of *Agricultural Chemicals*.

•

LOCKWOOD

(*Continued from Page* 13)

Being of emergency nature, it follows therefore, that when the period of stern necessity ends, government manufacture of fertilzer should also terminate. When agriculture has had time to regain its equilibrium in this country and European economics are untangled so that the nations now receiving American-made fertilizer are able once more to produce their own, then we should have the positive assurance that American manufacturers will be permitted to perform their normal functions without governmental competition.

Every precaution should be taken to prevent the present emergency from developing into a permanent setup. Plants now being used by the government for the manufacture of fertilizer should be either reconverted to other uses, or sold to private fertilizer producers in order to maintain a sound and smoothly-functioning industry. A sound economic system cannot tolerate the permanent invasion of the functions of private business by government.

MARKET REPORT

(*Continued from Page 42*)

47,000 tons smaller. The first quarter of 1946 saw a decrease of 35 per cent in tonnage and 20 per cent in dollar value of total imports.

With the increase of exports and decrease of imports, what of supplies in the United States and the outlook for the production of fertilizers?

The first quarter of 1946 saw ammonium sulfate output recover from the effects of the steel strike so that the March output was 61,178 tons. This production was an increase of 111 per cent over the preceding month and was but 13 per cent under that of March, 1945.

Superphosphate production in March exceeded that of the same month last year. In line with the high rate of output which has characterized previous months, production of normal superphosphate amounted to 647,919 tons (basis of 18 per cent P_2O_5). With heavy demand for the material, stockpiles dwindled. Nearly 200,000 more tons were shipped and used than were produced.

During May, no particular change was noted in the supply of phosphate rock. Although superphosphate manufacturers are being supplied with raw material to maintain a high rate of production, increasing exports and heavy domestic demand exceed the available supply. ★★

NEW EQUIPMENT

(*Continued from Page 18*)

side of the fuselage. Further experimentation with the helicopter is definitely desirable in the agricultural pest control field.

Custom Stock Dipping

IN passing it is of interest to note the development of custom sheep dipping in New York State with the introduction of the portable dipping vat. For the most part, the county Farm Bureaus in the important sheep growing areas built their own vats and contracted with growers to dip for a definite cost per head. The portable vat is easily hauled behind a truck or tractor and set up in the barnyard, filled with water and insecticide and the entire flock dipped. With the folding, demountable ramps, the vat is quickly taken down and drawn to the next farm where it is reassembled and used. This type of custom dipping operation has enabled many growers with small flocks to keep their sheep free from external parasites at a nominal expense where otherwise they would have been unable to do so because the cost of building a vat for a small farm flock would have been prohibitive. A similar type of operation in some counties made use of a portable dusting machine for treating feeder lambs in the late fall and winter to rid them of 'ticks' at a season of the year when dipping was not feasible. I feel certain that we shall see more custom operations where there is reasonable possibility of the enterprise being successful.

There is daily evidence of attempts to adapt material of war to

peacetime uses. The familiar jeep of the past few years is now being tested and in a number of instances used for agricultural purposes. The experimentation behind the development of flame-throwers for weed killers in corn and other suitable crops is another example. Many industrial uses of wartime developments will without doubt greatly benefit civilian needs. In the agricultural pest control field, several developments of equipment for application of insecticides and fungicides are the direct outgrowth of their production for military purposes. As has been pointed out earlier, field experimentation is aiding in improvement of some of these newer methods which are still undergoing change as additional data on performance are obtained. Some are in the transitional stage between research models and those ready for grower use. Others are promising but still undergoing development.

The axial-flow turbine blower has attracted much attention as a piece of equipment relatively light and maneuverable in construction which offers a means of applying atomized liquid spray concentrates, dusts, or a combination of dust with spray or spray concentrate for the same machine. A large volume of air at rather high velocity carries the dust or spray concentrate. The remarkable results obtained on shade and forest trees for the control of the gypsy moth and certain other pests when using DDT concentrate applied by a turbine blower illustrate the possibilities afforded by this type of equipment. Many other uses in agriculture are being investigated currently where insecticide concentrates or a combination of spray and dust might be feasible. There is little question as to the desirability of using a moving stream of air to carry a finely atomized insecticide concentrate into shade trees where in some instances it has been reported that less than a pint of the concentrate dispersed by the turbine blower affords as good protection as many gallons of liquid sprays applied from high pressure sprayers. Unquestionably we will see rapid expansion of atomized concentrates in many fields of insect control as suitable equipment becomes available for their application.

Fog Machine Developed

ANOTHER method for concentrate application is the fog applicator. These machines evolved from the ones originally produced for screening military operations and equipment during the recent war. The thermally produced aerosols from the fog applicators can be controlled within definite limits as to particle size and afford possibilities in the public health, structural and agricultural pest control fields. One type of applicator works on the principle of atomizing a solution or suspension into a blast of heated air which immediately becomes a fog of selected particle sizes upon contact with the surrounding air. Another type of generator uses steam as an atomizer and propellant for the material dispersed. Other thermally produced aerosols from airplanes by exhaust-venturi equipment have proved effective for certain uses in the public health field and will doubtless be given thorough consideration and evaluation in agriculture. An advantage of the thermal aerosol is the ability to deposit minimum dosages of DDT or other materials rapidly. The insecticide fogs are however, subject to wind drift and convection currents and in some instances their efficiency might be improved by direction of the fog through an axial flow blower. Another method of coping with the same problem has been to increase particle size. Although the thermal aerosols have proved their value in the field of public health and control of insects annoying to man and animals, their use in agriculture is still in the experimental stage and is undergoing intensive work in many areas of the country this season on a wide range of problems.

The gas-propelled aerosol is a familiar item in many stores and households as a new method for controlling flies and other household insect pests. From the point of view of agriculture, this principle of application holds interesting possibilities in greenhouse use as well as on field and row crops such as peas and onions. The insecticide concentrate is placed in a cylinder into which a gas is introduced under pressure. When the gas is released, the insecticide is propelled through an atomizing nozzle and is broken up into finely divided particles in air suspension as the "Freon" evaporates. Home use of the gas propelled aerosol is reported with country wide sale of the household sizes. Detailed experimental work for their use in agriculture is being continued by a number of workers.

The Speed-Sprayer, designed in Florida several years ago for spray applications on citrus crops has expanded its usefulness into other areas and in the deciduous fruit field. A large volume of air is moved across a bank of nozzles from which the spray liquid is discharged under relatively low pressure. The large volume of air carries the spray into the tree without the high pressure which is to be found with standard orchard sprayers. The operator is able to direct the flow of spray into the tree by operation of mechanical vanes as well as control of the banks of nozzles. This principle of application has the advantage of being 'kind to the foliage' and requires less manpower for operation than high pressure sprayers. Servicing truck units keep the sprayer in almost continuous operation by quick refilling of the sprayer with a minimum loss in spraying time.

In the 1930's, California workers developed a high volume, low velocity duster with atomizing attachment which provided a means for applying insecticides and fungicides to citrus and other tree crops. With a thought to testing this principle in New York on apples, research workers at the Cornell station undertook work with equipment of this type in comparison with the standard orchard duster of the high velocity type. It soon became obvious that one of the problems to be overcome was the matter of depositing quantities of material on the fruit and foliage to obtain disease and insect control. Under practical conditions it is not always pos-

sible to select ideal dusting conditions of quiet weather with moisture on the foliage and still time the applications to coincide with seasonal development of the pests. The equipment was modified and rebuilt to inject a liquid under pressure into the dust stream producing what has been called a spray-duster. Field experience has shown that the average sized apple tree from eighteen to twenty feet in height can be covered with approximately a pound and a half of dust with a gallon and a half of water. Additive materials in the water in the form of stickers and spreaders increased the amount and uniformity of the deposit. Further experimental work is underway to devise the proper angle of the dust outlet in relation to the tree for even coverage in both top and bottom of the tree. Once the machine is perfected for use on apples, the whole field of valuation of fungicides and insecticides with various supplemental materials remains to be worked. This principle of application offers an advantage of being able to displace the atmosphere within and around a tree with a wet dust without blowing the materials through the tree at a high velocity. Also the wet dust obviates the need for dew on the foliage and lengthens the period of effective operation as well as affording better direction of the dust stream in case of light wind. Various types of experimental equipment with the standard high velocity orchard type duster are being tested. In some instances liquids other than water are atomized into the dust stream; a similar introduction of water under pressure with an added spreader-sticker as described above for the high volume spray-duster has proved effective experimentally in converting the standard high velocity orchard duster into a spray-duster. The best procedure of the several possibilities thus far tried remains to be determined. The principle, however, has demonstrated its merit and is undergoing further experimentation.

It is interesting to note a method of insect and mite control in the greenhouse florist crop field by use of selenium salts applied to the soil in which the plants are growing. Sodium selenate primarily is being used. The introduction of this method has proved of immense value to commercial florists. It is an example of absorption of a toxicant by growing plants which kills certain species of insects and mites when they attempt to feed on the treated plants. Poison hazards from the use of selenium definitely limit it to non-edible crops. A companion development of fumigating roses and several other florist crops with azobenzene offers real promise for eliminating some of the florist's most serious pests.

It goes without saying that research by government and industry is directed toward better methods of insecticide and fungicide application. We have materials that are above threshold in efficiency and afford amazing results in the control of major pests. In addition, they open new fields of insect and disease control heretofore held impracticable. A few of the new principles of application have been mentioned without an attempt to

evaluate their place in the agricultural field; final judgment must be withheld until more evidence is available. From the viewpoint of the grower and other users of agricultural insecticides and fungicides, the widespread interest and research on the part of all members of the team, the chemist, the engineer, the entomologist and plant pathologist, should produce a more effctive and economical program of insect and disease control. It is a complicated program but one that is yielding results. Because of the diversity of materials and problems, no single piece of equipment will ever be suitable for all application needs. Many different developments will bring forth special equipment for particular needs. The farmer is farther ahead with new materials available to him at the moment than he is with improved equipment for their application. It takes both to do the job. Research with machinery is an important and continuing problem; it must be so recognized and keep abreast with the development in the chemical field. There is an increasing alertness on the part of plant pathologists and entomologists as to their responsibility in establishing leadership in research with equipment. Engineers must build the equipment but they need help in understanding exactly what the machine is expected to do in terms of disease and insect control. More than ever before the joint efforts of the professional workers and the engineers must be directed in a cooperative approach to the machinery problem. ★★

"DITHANE" FUNGICIDE

(*Continued from Page* 43)

either. The highest potato yields in Maine last year are said to have been produced on acreages to which this combination spray was applied. Such a program is not experimental, having been used successfully in various growing areas.

Any discussion of blight control fungicides should carry a word of caution regarding use and methods of application. Higher yields are possible only if the fungicidal material is used according to directions. Although experience in treating commercial crops with synthetic fungicides has indicated that the materials are effective in bringing blight under control, it is still easier and safer to prevent blight than to stop it once it has taken hold of a crop.

Potato plants must be sprayed weekly from the time the stems are six inches high in order to assure complete protection. The foliage should be covered adequately with the recommended strength of fungicide. (the recommended rate of application for the "Dithane", zinc sulfate and lime mixture is 100-125 gallons per acre.)

Although "Dithane" was developed primarily as a potato fungicide, experiments have been made on other crops to broaden its scope of usefulness. For instance, this year the product was called into use in Florida to combat severe late blight on tomato plants (caused by the same fungus that is responsible for late blight on potatoes) More than 8,000 acres of tomatoes were sprayed in Florida with gratifying results. One grower is reported to have salvaged a good yield from a field which had been abandoned earlier in the season because of blight. Applications of "Dithane" halted the disease, and the crop, although damaged by the initial infection, was marketed at a profit.

Celery is another crop which has benefitted by the development of "Dithane." Some Florida celery growers harvested from treated plots 100 more packed crates per acre than from similar plots where other fungicide mixtures had been used, according to Rohm & Haas Co. "Dithane" is also credited with being the first practical control for blight on commercially-grown azaleas in the south. Tobacco and cabbage growers are among others using this fungicide effectively. ★★

Cameron Siddall has joined Pennsylvania Salt Company at its Cotton Poisons plant in Bryan, Texas. Mr. Siddall was formerly connected with Texas A. & M. College as an entomologist.

Advertisers' Index

(The Advertisers' Index has been carefully checked but no responsibility can be assumed for any omission.)

TALE ENDS

BOYS of the Future Farmers of America organization in southwestern Oklahoma are learning first hand lessons about controlling flies which bother livestock. Using a motor-driven orchard spray which was bought early this year for DDT demonstrations, the boys took it out to nearby ranches and sprayed whole herds of cattle in single afternoons. Success is reported to have crowned their efforts to such a degree that pools were formed and more sprayers purchased in the area. During the past winter the equipment was used for killing grubs. Ranchers declare that the treatment on cattle is worth a pound of beef a day for each animal during fly time because the animals eat all day long instead of using their energy fighting insects.

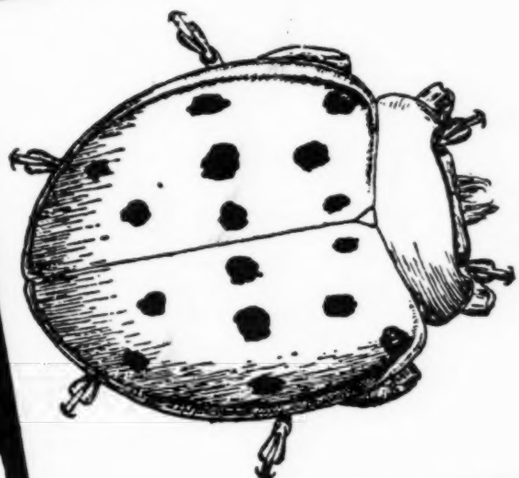
•

News reports tell about more and more farmers solving ditch-digging problems through the use of dynamite to blast drainage troughs through the ground. Although this activity on the farm is not intended as an insecticidal measure, no doubt the blast and concussion kills many an insect in the vicinity. Manufacturers and distributors of insecticides need not be alarmed at this development, however. Such blasting has been going on for years, and still chemical insecticides are very much in front as a means of killing pests.

•

Along this same explosive line, reports from Bikini indicate that entomologists involved in the atomic bomb test there had to turn in incomplete records of how the blast affected insect life. The reason is that large quantities of DDT had been sprayed over the islands before Seabee forces went to work there some weeks preceding the bombing test. The insecticide had been applied to abate a plague of flies, but in spraying wide areas of the islands, other insects in addition to flies were eliminated, giving entomological observers but little upon which to build a report.

MEXICAN BEAN BEETLE



BUG OF THE MONTH

PRENTISS FOR PEST-TESTED *Basic Insecticides*

Here's the number one pest on string and lima beans—the Mexican Bean Beetle! The one time-tested method of controlling the Mexican Bean Beetle is to spray or dust with Rotenone.

For the formulation of your Rotenone products use *Prentiss Cube Powder*, finely milled and uniformly batch mixed and tested.

Prentiss also can deliver the following basic agricultural products "when you want them as you want them":

(1) Micro-Mesh Wettable—A 50% DDT powder formulated for agricultural sprays, and milled to an average particle size of 1.5 microns.

(2) Micro-Mesh Dry—A 50% DDT powder for blending in agricultural dusts; also milled to an average particle size of 1.5 microns.

(3) 25% Water-Miscible DDT Concentrate—Ideal for use where emulsions as sprays are indicated.

(4) Pyrethrum Powder — A specific for many agricultural pests. Finely ground and adapted for agricultural dusts containing pyrethrum.

It will pay you to investigate Prentiss Basic Agricultural raw materials and intermediate products for use in the manufacturing and mixing of your agricultural and livestock insecticides.

R. J. PRENTISS & COMPANY, INC., 110 William Street, New York 7, N. Y.

Plants: Brooklyn, New York and Newark, New Jersey

PRENTISS

RAW MATERIALS FOR AGRICULTURAL INSECTICIDES

In Time of Famine Abroad . . .

It is good to be able to say, "how green are our valleys," wise to consider what has kept them green . . . fertile soil, ample sunshine and rain, prudent cultivation . . . the wisdom of our scientists in making available new and better insecticides for the protection of crops. These have been the vital elements contributing to our abundance. Stimulated by the pressure of necessity, as well as by scientific interest, the chemist and his co-workers during the past quarter century have developed many new and relatively effective compounds and techniques of application. But for one exception, DDT is the newest and most glamorous of these. That exception, of course, is VELSICOL 1068, the product of an American laboratory which has opened a new era in insect control . . . Its usefulness in the agricultural field, now under intensive investigation, has already been demonstrated. As an example, we single out the grasshopper, omnivorous and difficult to control, from a wide variety of insects against which VELSICOL 1068 is remarkably effective. And in addition to its insecticidal power, VELSICOL 1068 is outstanding in adaptability and ease of formulation . . . as an oil spray, a water-emulsion or dust. Soluble in all commonly used organic solvents, it is stable at all atmospheric temperatures. VELSICOL 1068 TECHNICAL, 90% purity, is now available for agricultural formulations. Samples and complete information on request.

VELSICOL Corporation

Manufacturers of Insect Toxicants • Aromatic Solvents • Synthetic Resins • Coresin Core Oil

***General Offices:* 120 East Pearson Street • Chicago, Illinois**

Branch Offices: New York • Detroit • Cleveland • San Francisco • Los Angeles

*U. S. PATENTS PENDING